THE TAMILNADU
DR. MGR MEDICAL UNIVERSITY
CHENNAI, TAMILNADU

A STUDY OF COMPLICATIONS
IN MESH VS NON-MESH REPAIR IN INGUINAL HERNIAS IN
GOVERNMENT RAJAJI HOSPITAL, MADURAI

DISSERTATION SUBMITTED FOR
BRANCH- I M.S. (GENERAL SURGERY)

MARCH -2009

CERTIFICATE

This is to certify that the dissertation entitled " A Study of Complications in Mesh Vs Non- mesh Repair in inguinal hernias in Government Rajaji Hospital, Madurai" submitted by Dr. R. Hemamalini, to the TamilNadu Dr. M.G.R. Medical University, Chennai, in Partial fulfillment of requirement for the award of M.S. Degree- Branch I (General Surgery) is a Bonafide research work carried out by her under direct supervision and guidance.

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DECLARATION

I, **DR. R. HEMAMALINI** declare that, I carried out this work on "A Study of Complications in mesh Vs non-mesh repair in inguinal hernias in Government Rajaji Hospital, Madurai" at the department of surgery, GRH during the period of September-2006 to September 2008. I also declare that this bonafide work or part of this work was not submitted by me or any others for any award, degree, or diploma to any other university or board within India or abroad.

This is submitted to the TamilNadu DR. M.G.R. Medical University, Chennai in partial fulfillment of the rules and regulations for the M.S. Degree examinations in General Surgery.

Place: Madurai

Date : **DR. R. HEMAMALINI**

ACKNOWLEDGEMENT

I wish to express my sincere gratitude to my unit chief and head of the Department of Surgery, **Prof. Dr. M.Gopinath, M.S,** for his unstinted encouragement and valuable guidance during this study.

I wish to express my gratitude to our Dean (I/C), **Dr. S.M. Sivakumar, M.S.,** Govt. Rajaji Hospital and Madurai Medical College for permitting me to use the clinical materials of this hospital for the study.

I wish to express my sincere thanks to my unit Assistant Professors, **Dr. Vijayan. M.S., Dr. Nasheer Ahamed Syed. MS., DR. Thara. M.S., D.G.O., Dr. Maruthupandian M.S., Dr. Ganesan M.S.,** and **Dr. Karunakaran M.S.,** for their valuable guidance during this study.

I am thankful to all the patients who have ungrudgingly lend themselves to undergo this study, without whom this study would not have seen the light of the day.

INDEX

INTRODUCTION

The hernia is the most common surgical problem present in all age groups, in all the countries through out the world.

Hernia has been known since ages and noticed when the man started to stand and walk on two legs.

Inguinal hernia is the most common condition requiring surgery and inguinal herniorrhaphy was the common procedure performed by a general surgeon.

When the modern techniques for inguinal hernia repair were described in 19th century, recurrence was the problem.

All conventional tissue repairs have a common problem in suture line tension. This tension is the prime cause for tissue or suture disruption causing hernia recurrence.

The advent of synthetic mesh made possible the bridging of large gaps in the tissues without tension, making it possible to cure every hernia, irrespective of its size or shape.

The “Lichtenstein” introduced his pioneer concept of “tension – free” repair of inguinal hernias using synthetic polypropylene mesh. This technique opened a new era in inguinal hernia repair.

The Lichtenstein repair can be done as an out patient procedure under local anesthesia with high patient acceptance, less post operative pain which permitted immediate ambulation and an early return to normal activities.

Now Lichtenstein tension free repair is considered as a gold standard technique for inguinal hernia repair.

Although groin hernia repair is associated with excellent short and large term outcomes, complications of the procedure exist and must be recognised.

AIMS AND OBJECTIVES

Our aim of study is to compare complications in mesh vs non – mesh repair done for inguinal hernias in Government Rajaji Hospital, Madurai, by the following factors:

I. Intra operative complications

II. Post operative complications

REVIEW OF LITERATURE

The earliest record of inguinal hernia dates back to 1500 BC. The term derives from the Greek word meaning an offshoot, a budding or a bugle. In Latin word hernia means rupture or tear. Trusses and bandages were used to control the herniation.

The earliest description of inguinal hernia surgery was found in the 1st century AD by Roman surgeon Celsus. Though a scrotal or groin incision, the hernial sac was separated from the spermatic cord and transected at the external inguinal ring and removed.

'Heliodorus' was the first surgeon to perform the hernia operation and described the twisting of the neck of the sac before amputation.

Paul of Aegina [700 AD] described mass ligature of the sac and cord at the external ring with excision of the sac, cord and testis distal to the ligature. Casper Stromayer [1559] distinguished direct and indirect hernia and advised that the testicle need not be removed during the repair.

Astley's Cooper [1804] said "No disease of the human body, belonging to province of the surgeons, requires in its treatment a greater combination of accurate anatomic knowledge with surgical skills than hernia in all its varieties"

Marcy [1881] described the anatomy of the internal ring, high ligation of the sac and the importance of the obliquity of the canal and the fascia transversalis. The Lucas – Championiere, first opened and explored the inguinal canal.

Edoardo Bassini [1884] Italian surgeon was the first to transplant the spermatic cord and thus performed the true herniorrhaphy. The floor of the canal was constructed and consists of a ‘triple layer’ of transversalis fascia, transversus abdominis and internal oblique. The external oblique muscle was closed over the cord. He reported an incidence of recurrence of less than 2.6% in 262 hernia repairs. These results earned him the title of “Father of modern herniorrhaphy”

Halsted [1889] done a hernia surgery in which he placed the spermatic cord superficial to the external oblique muscle. A.H. Ferguson abandoned cord transplantation but instead stressed the repair of transversalis fascia.

During the next 100 years most inguinal hernias were repaired by the Bassini’s method or variations of it. Among the notable improvements is the multilayered repair described by shouldice in 1953. This method is probably the most successful of the pure tissue repair methods, suturing only the local tissues. However, this method is rather complicated and in some cases calls for extensive dissection and suturing under tension. A hernia repair done with undue tension is doomed to be failure. The recognition of excessive suture line tension was primarily responsible for higher recurrence rate. The significant recurrence and postoperative pain following tissue based repairs led to the introduction of ‘tension free surgery’.

The earliest use of man made prosthetic reinforcements for hernia repair was the use of silver coins placed on the floor of the inguinal canal by phelps [1894]. The Filigree became the first prosthetic mesh to be routinely incorporated in repair of difficult and recurrent hernias.

Usher [1960] wrote “we have found that if the mesh is used to bridge the defect instead of as a reinforcement for tissues approximated under stress, factor of tension is eliminated, and recurrence become less likely”. Coollier and Griswald [1967] described the routine use of polypropylene mesh in inguinal hernia repairs.

In 1974 Lichtenstein, described a method of using a rolled up piece of mesh in the form of plug to repair both discrete recurrent inguinal hernia and femoral hernias. The aim being to avoid any suture line tension. In 1984, he described the use of 3cm x 8cm plastic mesh screen to reinforce the repair of direct and indirect hernias. In 1986, he described tension free repair carried out on 300 consecutive inguinal hernias, with follow up of 2 years. No attempt was made to bring the transverse abdominis or internal oblique muscle down to the inguinal ligament and no sutures were placed at the deep ring. Lichtenstien and colleagues in 1989 described the prosthetic screen onlay technique, the ‘tension – free hernioplsty’ in 1000 patients with minimal complications and no recurrence after a follow up between 1 and 5 years. He proposed routine use of this technique for all inguinal hernias.

With the advent of laparoscopy for general surgery, various laparoscopic techniques have been developed for inguinal hernia repair, including the trans abdominal pre-peritoneal repairs, the intra peritoneal onlay mesh repair and the totally extra peritoneal repairs. Lichtenstein tension free operation is less dependent on the experience of the surgeons but conventional tissue repair and laparoscopic operation is dependent on the experience of surgeon.

Nordin – P. Etal in British journal of surgery in 2002, reported that the Lichtenstien hernia repair was easier to learn, took less time and resulted in fewer recurrences. It was possible to achieve excellent results with this technique in a general unit. So the Lichtenstien technique can be safely applied to all direct, indirect and recurrent hernias.

Anatomy

Embryology

The inguinal canal is a caudal evagination of the abdominal wall that forms when the processus vaginalis grows inferiorly, pushing sac like evaginations which consists of various layers of the abdominal wall. The processus vaginalis is a pouch of peritoneum, which develops just adjacent to the inferior root of gubernaculum.

The inguinal canal conveys the testis to the scrotum and forms the sheath of the spermatic cord. The first layer encountered by the processus is the transversalis fascia lying deep to transverses abdominis. This layer will become the internal spermatic fascia of spermatic cord. The processus pick up the fibres and fascia of the internal oblique muscle and form the cremasteric fascia of spermatic cord. Finally the processus picks up a thin layer of external oblique muscle, which will become the external spermatic fascia. In males, the processus vaginalis pushes this entire inguinal ‘sock’ out into the scrotal swelling.

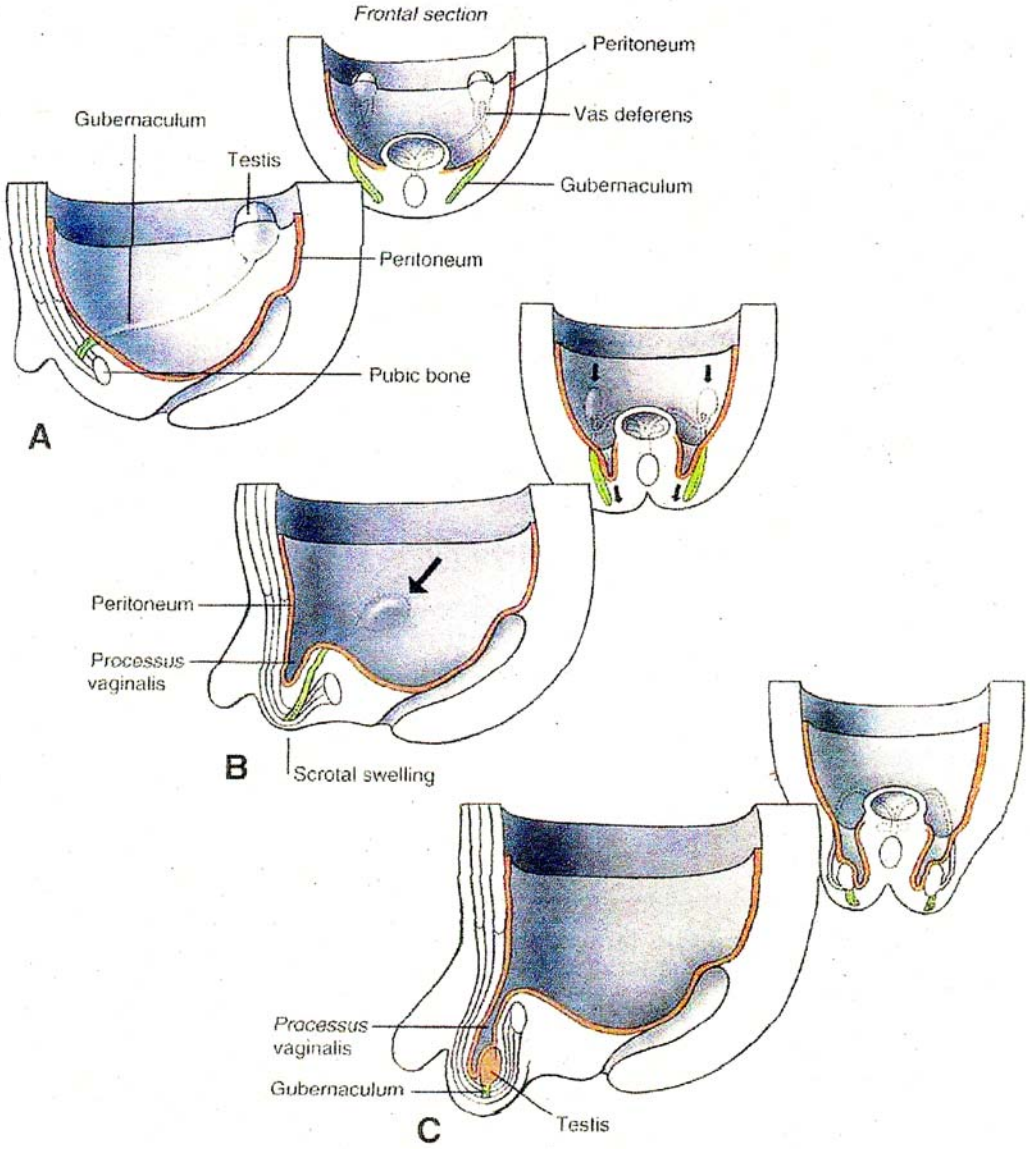
The superior rim of inguinal canal, the point of weakening and evasion of fascia transversalis, is called deep inguinal ring. The infero-medial rim of canal formed by the point of eversion of external oblique muscle is called superficial ring of inguinal canal.

The testis descends to the deep ring by the third month and completes the descent in 7 and 9 months. Between 7 and 12 weeks the extra inguinal portion of gubernuclum shorten and pull the testis down the deep inguinal ring but then enter the inguinal canal in response to shortening of gubernaculum. The testis remains within the sub serous fascia of processus vaginalis through which they descend towards scrotum. By 9^{th} month the testis has completely entered the scrotal sac and gubernacalum is reduced to a small ligamentous band attaching the inferior pole of testis to the scrotalfloor. The superior portion of the processus vaginalis is usually obliterated, leaving only a distal remnant sac, the tunica vaginalis, which lies anterior to testis.

In females, the ovaries descend into the pelvic cavity and associated with developing uterus. Therefore, the only remaining structure passing through the inguinal canal is round ligament of uterus, which is a remnant of gubernaculum.

The development sequence is completed in both sexes when the processus vaginalis obliterates. If obliteration does not occur or incomplete, a potential weakness exists in the anterior abdominal wall and an indirect inguinal hernia may develop.

Embryology of testicular Descent



Descent of the testes. *A–C*, Between seventh week and birth, shortening of the gubernaculum testis causes the testes to descend from the 10th thoracic level into the scrotum. The testes pass through the inguinal canal in the anterior abdominal wall.

Anterior abdominal wall and inguinal region

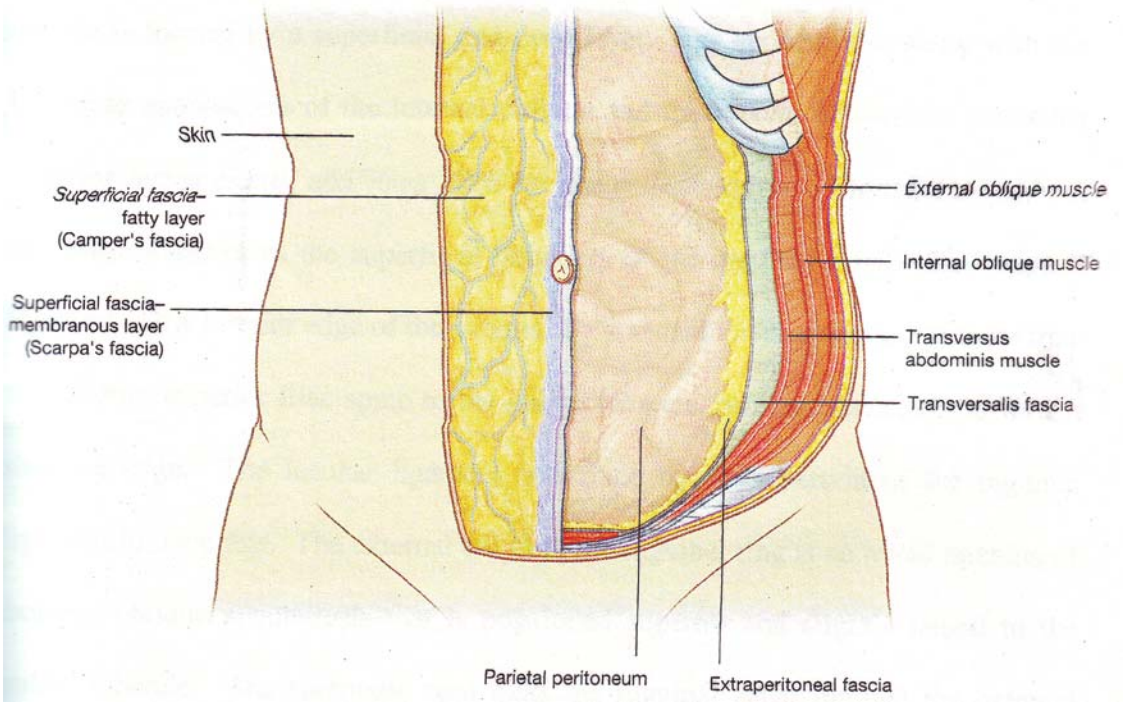
The inguinal region is the area of junction between the Anterior abdominal wall and the thigh. Here a portion of aponeurosis of the abdominal muscle inserts into the inguinal ligament and blends inferiorly with the fascia lata of thigh. The above definition adequately characterizes the external anatomy of the inguinal region, but it does not define the complex deep inguinal region. As a consequence, the superficial anterior abdominal wall and external aspect of inguinal region will be discussed as a unit.

Structure of the anterior abdominal wall

Skin and superficial fascia

The skin is loosely attached to the underlying structures except at the umbilicus where it is tethered to the scar tissue. The superficial fascia can be divided into a superficial fatty layer known as fascia of camper and deep membranous layer known as scarpa's fascia. The fatty layer is thick and is continuous with the superficial fat over the rest of the body. The membranous layer is thin and fades out laterally and above where it continues with the superficial fascia of back and thorax. Inferiorly it passes on to the front of thigh, where it fuses with the deep fascia below the inguinal ligament. In the midline inferiorly, the membranous layer of fascia is not attached to the pubis but forms a tubular sheath for the penis [or clitoris]. Below in the perineum it enters the wall of the scrotum[or labia majora] and attached on each side to the margin of the pubic arch, it is here known as Colle's fascia. In the scrotum the fatty layer of superficial fascia is represented as thin layer of smooth muscle, the dartos muscle.

Layers of the abdominal wall.



Deep fascia

It is a thin layer of connective tissue covering the muscles, it lies immediately deep to the membranous layer or superficial fascia. The membranous layer of superficial fascia persists as a separate layer.

External oblique muscle and aponeurosis

It is the most superficial muscle and its fibers directed inferiorly, medially and lie deep to the subcutaneous tissues. The aponeurosis of the external oblique muscle is formed by a superficial and deep layer. This aponeurosis, along with the bilaminar aponeurosis of the internal oblique and transverses abdominis, forms the anterior rectus sheath and linea Alba by linear decussation. The external oblique aponeurosis serves as the superficial boundary of the inguinal canal. The inguinal ligament is the inferior edge of the external oblique aponeurosis and extends from the anterior superior iliac spine to the pubic tubercle, turning posteriorly to form a shelving edge. The lacunar ligament is formed by the insertion of the inguinal ligament to the pubis. The external (superficial) inguinal ring is an ovoid opening of external oblique aponeurosis that is positioned superior and slightly lateral to the pubic tubercle. The spermatic cord exits the inguinal canal through the external inguinal ring.

Internal oblique muscle & aponeurosis

It is a broad, thin muscular sheet that lies deep to the external oblique muscle. Its fibers are directed superiorly and laterally in the upper abdomen and in a transverse direction in the inguinal region. The internal oblique muscle serves as superior border of the inguinal canal.

The medial aspect of the internal oblique aponeurosis fuses with fibers from the transversus abdominis aponeurosis to form a conjoined tendon. The cremasteric muscle fibers arise from the internal oblique and encompass the spermatic cord.

Transversus abdominis muscle is a thin sheet of muscle that lies deep to the internal oblique and its fibers run horizontally forward. In the inguinal region these fibers course in a slightly oblique downward direction.

The aponeurosis, transversus abdominis covers both anterior and posterior surfaces. The lower margin of the transversus abdominis arches along with the internal oblique muscle over the internal inguinal ring to form the transversus abdominis aponeurotic arch.

The transversalis fascia is the connective tissue layer that underlies the abdominal wall musculature. It is referred as the endoabdominal fascia and is a component of the inguinal floor.

The iliopubic tract is a continuation of the transversus abdominis aponeurosis and fascia at the upper border of the femoral sheath. The ilio pubic tract also forms the inferior crus of the deep inguinal ring. The superior crus of the deep ring is formed by the transversus abdominis aponeurotic arch. The iliopubic tract is located posterior to the inguinal ligament and crosses over the femoral vessels and inserts on the anterior superior iliac spine and inner lip of the wing of the ilium.

The superficial epigastric, superficial circumflex iliac and external pudendal arteries are the branches of femoral artery and accompanying veins are tributaries of femoral vein.

Nerves of the anterior abdominal wall

They are anterior rami of lower six thoracic and first lumbar nerves. They pass between internal oblique and transversus abdominis muscle. The thoracic nerves are the lower five intercostals and sub costal nerves and first lumbar nerve is represented by ilio-hypo gastric and ilio-inguinal and genito-femoral nerve. They supply the skin of anterior abdominal wall, the muscles and parietal peritoneum. The lower six thoracic nerves supply the rectus muscle and pyramidalis. The ilio-inguinal nerve supply a portion of internal oblique muscle and accompanies the spermatic cord through external inguinal ring. It supplies the skin of medial thigh proximal to inguinal ligament, root of penis and upper anterior scrotum. In females, the nerve exits the external inguinal ring and supplies the mons pubis and labia majora. The genital branch of genito-femoral nerve exits the pelvis through the deep inguinal ring and continues with the spermatic cord supplying the cremastric muscle. It innervates the antero-lateral part of scrotal skin.

Lymphatics

The lymph channels in the inguinal region follow the course of main blood vessels. The inguinal nodes that drain the proximal thigh and perineum are in turn drained by the nodes within the femoral canal and then to the lymphatics surrounding the external iliac vessels. The major external iliac lymph chain that is located on the medial side of the external iliac group is frequently found on the antero-lateral aspect of external

iliac artery just internal to the deep ring. The lymphatic channels from the testis and spermatic cord follow the testicular vessels and drain in the Para aortic nodes.

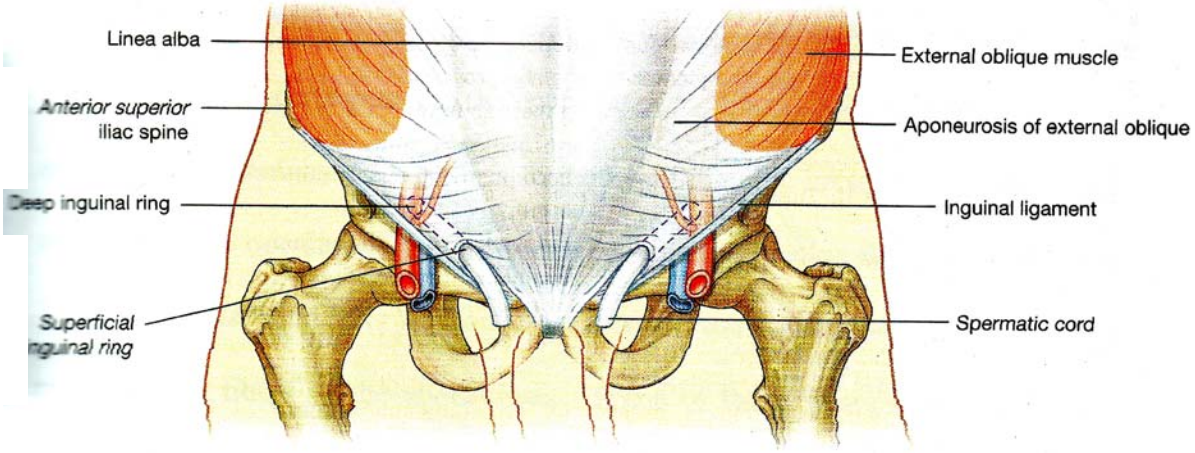
Inguinal canal

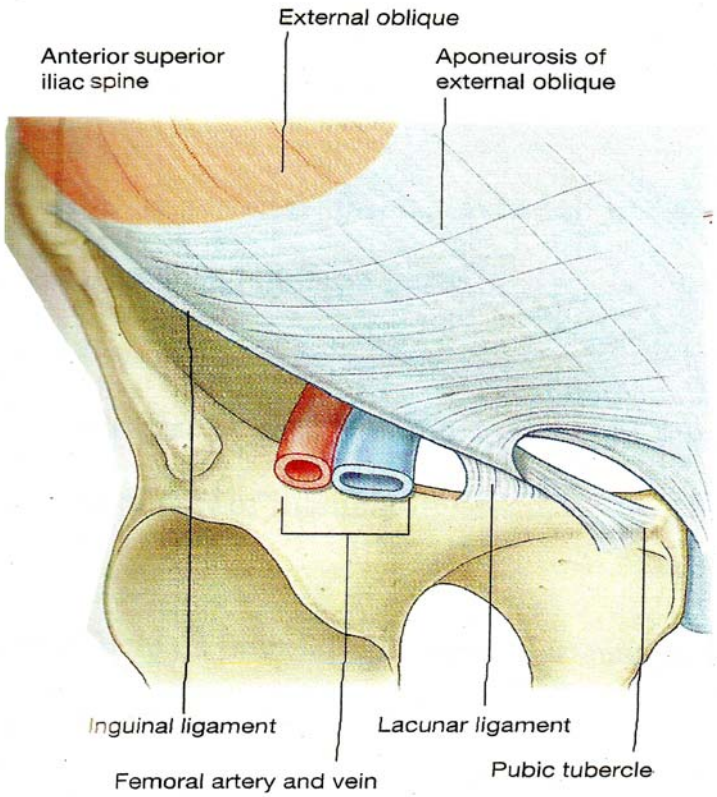
It is a slit like passage 4cm in length that extends in a downward and medial direction just above and parallel to lower half of inguinal ligament. It begins at deep inguinal ring and ends at superficial inguinal ring. In infants the superficial and deep inguinal rings are almost superimposed and the obliquity of this canal is slight. The contents of canal are spermatic cord and ilio-inguinal nerve in males and round ligament of uterus, ilio-inguinal nerve in females.

Deep inguinal ring

It is an opening in the fascia transversalis 1.25 cms above the mid inguinal point that is between pubic symphysis and anterior superior iliac spine. It is of an oval shape, the long axis being vertical. It is larger in male than in female. At its margins the fasica transversalis is condensed. Medially it is related to the inferior epigastric vessels. It transmits the spermatic cord in male and round ligament of uterus in the female.

Inguinal canal.





Ligaments formed from the external oblique *aponeurosis.*

Superficial inguinal ring

It is an opening in the aponeurosis of external oblique muscle. It is situated just above and lateral to the Pubic crest. The aperture is somewhat triangular with its long axis oblique corresponding to the course of the fibers of the aponeurosis. This is smaller in the females. Its base is formed by the pubic crest and its sides by the margins of the opening of the aponeurosis, which are called the crura of the ring. The lateral crus of the ring is stronger. There are some fibers which course at right angles to the fibers of the aponeurosis. Some of these fibers may arch over the superficial inguinal ring and called the inter crural fibers. The superficial ring gives passage to the spermatic cord and ilioinguinal nerve in the male and round ligament of uterus and ilio-inguinal nerve in case of female.

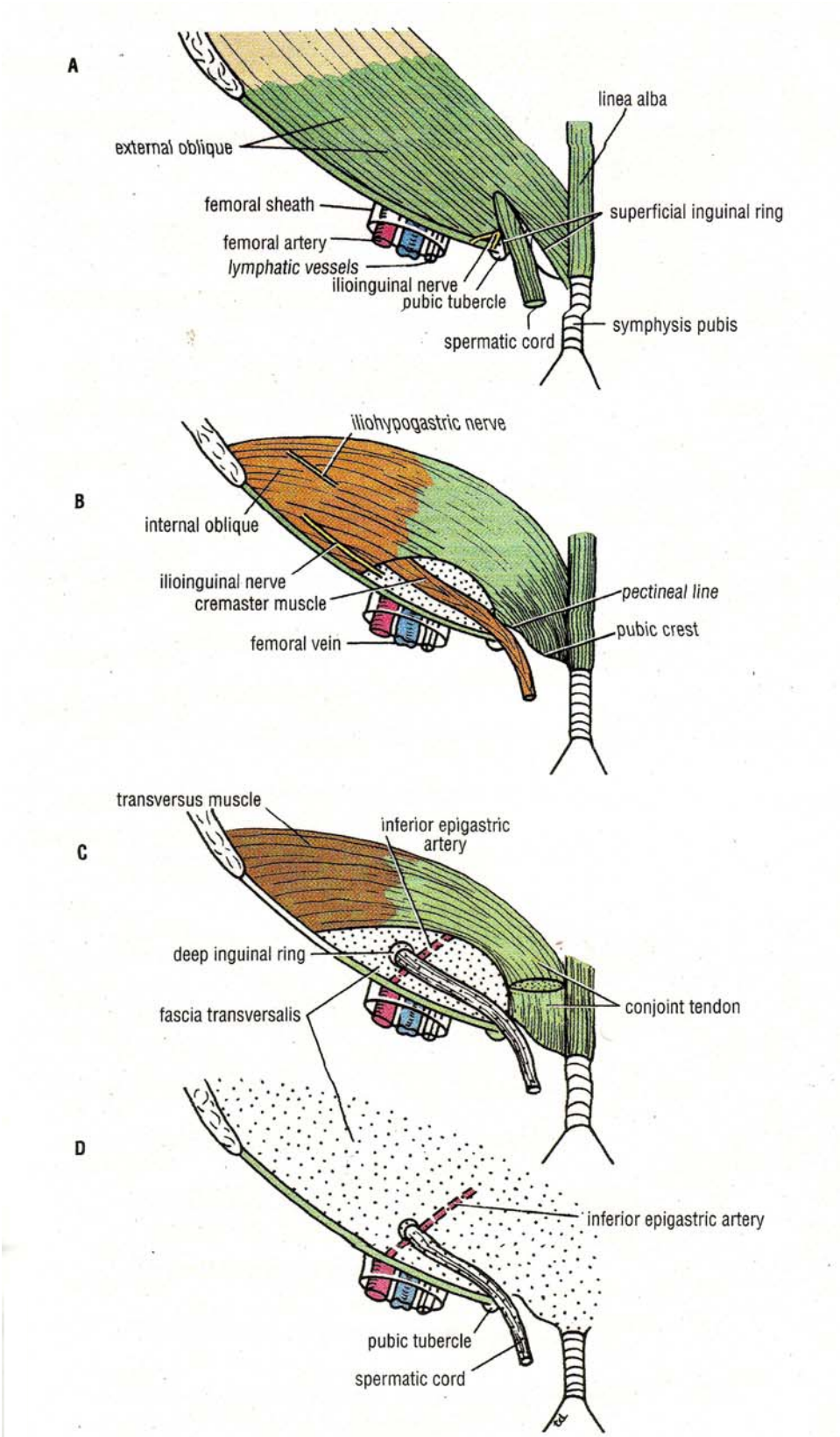
Boundaries of inguinal canal

Anteriorly – skin, superficial fascia, external oblique aponeurosis and lateral 1/3 by fleshy fibers of internal oblique muscle.

Posteriorly-transversalis fascia along the whole length, medial ½ by conjoined tendon and reflected part of inguinal ligament

Above – arched fibers of internal oblique and transversus abdominis before they fuse to form conjoined tendon.

Below or floor- grooved upper surface of inguinal ligament and its union with transversalis fascia. At its medial end there is lacunar ligament.



Inguinal canal showing the arrangement of the external oblique muscle (**A**), the internal oblique muscle (**B**), the transversus muscle (**C**), and the fascia transversalis (**D**).

Contents of inguinal canal

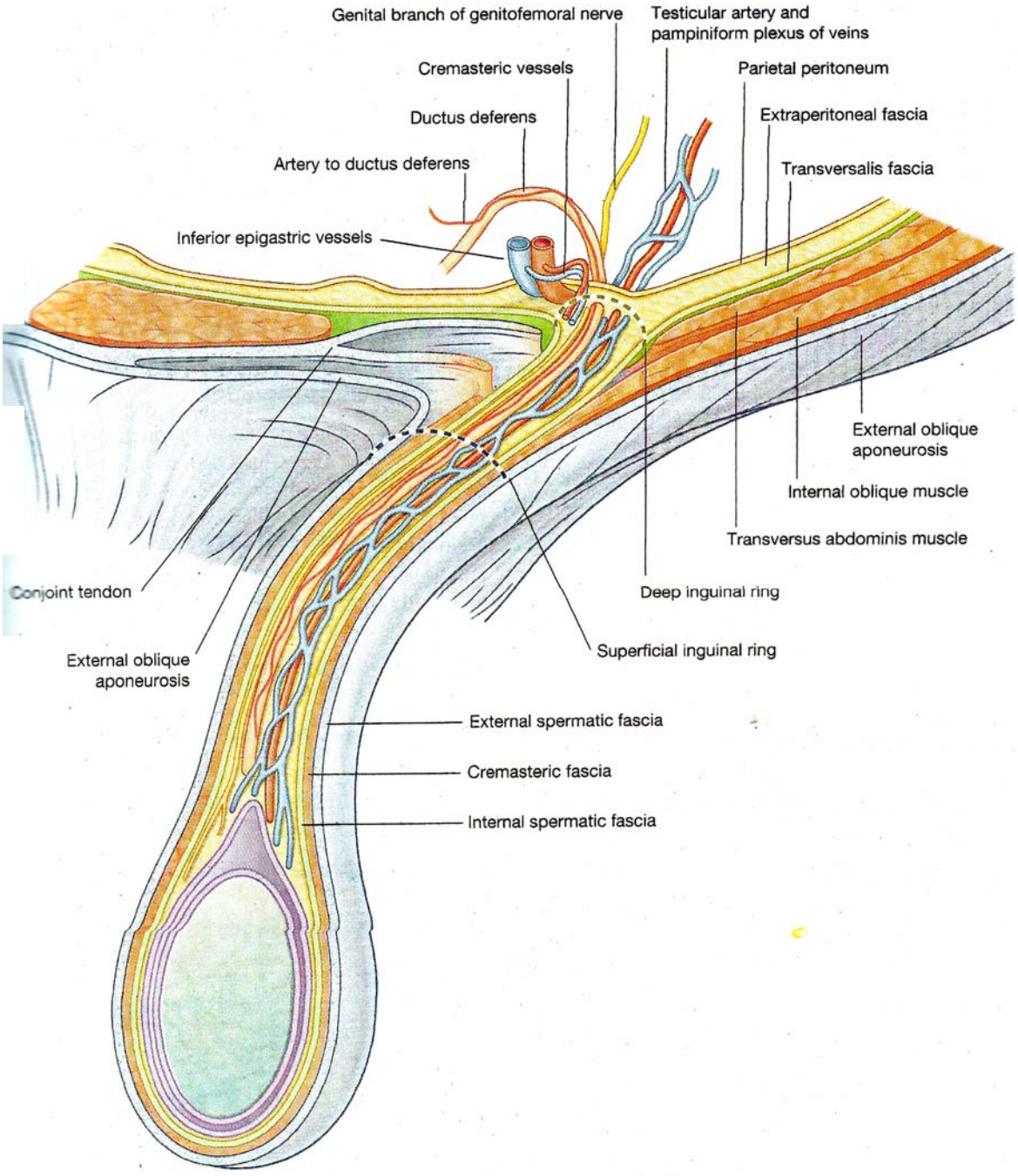
- Ilio-inguinal nerve
- Spermatic cord and its coverings in males
- Round ligament of uterus in females

Coverings of the spermatic cord

- Internal spermatic fascia – from fascia transversalis at deep ring.
- Cremasteric fascia – from muscular fasciculi of internal oblique muscle.
- External spermatic fascia – thin fibrous membrane continuous above with the aponeurosis of obliquus externus abdominis at the superficial ring.

Structures of the spermatic cord

- Ductus deferens.
- Artery to ductus deferens.
- Testicular artery.
- Pampiniform plexus of veins.
- Cremasteric artery and vein.
- Genital branch of genito-femoral nerve.
- Sympathetic and visceral afferent nerve fibers.
- Lymphatics.
- Remnants of processus vaginalis.



Spermatic cord.

Hasselbach's triangle

It is a weak spot of anterior abdominal wall through which direct inguinal hernia protrudes. It is bounded,

Medially – by outer border of rectus abdominis

Laerally – inferior epigastric vessels

Below – medial part of inguinal ligament

Floor – fascia transversalis.

Mechanisms which prevent hernia in the inguinal region

- Obliquity of the inguinal canal.
- Shutter mechanism of arched fibers.
- Sphincter action of transversus abdominis and internal oblique muscle at the deep inguinal ring.
- Ball valve action of cremaster.
- In front of deep inguinal ring, fleshy fibers of internal oblique muscle which prevents the entry of abdominal content through the deep ring.
- Strong conjoined tendon in front of the Hasselbach's triangle to prevent direct inguinal hernia.

ETIOLOGY

Evolution

All groin hernias share the common feature of emerging through the myopectineal orifice of Fruchaud, the opening in the lower abdominal wall bounded above by myo aponeurotic arch of the lower edges of the internal oblique and transversus abdominis muscles [conjoined tendon] and below by the pectineal line of superior pubic ramus. It serves as the passage for blood vessels, nerves, lymphatics, muscles and tendon between the abdomen and the lower limb. The space is divided into upper and lower halves by lower free aponeurotic edge of external oblique muscle [inguinal ligament] and is closed off posteriorly by the fascia transversalis.

In humans – absence of posterior rectus sheath below the arcuate line and only a rather insubstantial transversalis fascia unsupported by muscle or aponeurosis resisting the intra-abdominal pressure and holding the breach between the abdomen and thigh is compounded by upright posture leading to stretching of groin region.

Even though animals have patent processus vaginalis rarely they suffer from hernia. The reason being, thigh is flexed forwards, the groin structures are not stretched under tension and inguinal canal lies in the upward direction. The weight of the abdominal content is directed forward and downwards away from the inguinal region.

Patent processus vaginalis

It is the prime cause of indirect inguinal hernia in infants and children. The development of processus vaginalis, its migration into the scrotum, its final obliteration

are linked to the descent of the testis from the abdominal cavity into the scrotum. These processes are initiated and controlled by the calcitonin gene related peptide [CGRP] released by genito femoral nerve under the influence of fetal androgen. Between 26th and 40th week , the testis descends into the scrotum through internal ring and inguinal canal. After the testis reaches the scrotum, the lumen of processus vaginalis obliterates between internal ring and upper pole of testis.

Shutter mechanism

Straining, coughing, lifting of heavy weights and other activities increase the intra-abdominal pressure leading to risk of hernia but it is guarded by physiological shutter mechanism. It is activated when abdominal muscles contract and cause the intra-abdominal pressure to increase when performing this function. As the internal oblique and transversus abdominis muscles contract, their lower fibers forming the myoaponeurotic roof of the inguinal canal, the conjoined tendon that arches over the spermatic cord also contract sharply. As the fibers shorten, the arch straightens out and descends to lie close to or on the inguinal ligament to protect the fascia transversalis. Contraction of transversus abdominis muscle also pulls up and tenses the crurae of internal ring, which are made up of thickened bands of ilio-pubic tract and fascia transversalis, causing the ring to close like a sphincter snuggly around the cord. At the same time external oblique muscle contracts, its aponeurosis which forms the anterior wall of inguinal canal become tense and presses on the internal ring and on the posterior wall and reinforces them by counter pressure against the intra-abdominal forces that push outward.

Raised intra-abdominal Pressure

Pregnancy, cough, lifting heavy objects, obesity , constipation, prostration, chronic ascites, liver cirrhosis, malignancy, peritoneal dialysis causes raise in intra-abdominal pressure leading to the formation of hernia. Here the fascia transversalis and rest of the abdominal wall become passively stretched and thinned out. A decrease in oxytalan fibers and an increase in the amorphous substance of elastic fibers as function of age may be responsible for alterations in the resistance of transversalis fascia and highincidence of groin hernia in older men.

The integrity of fascia transversalis

The fascia transveralis on its own is not a very strong layer of abdominal wall. The ability of it is dependent on the state of collagen fibers that make up its tissues and give its strength. It may be thinned out by factors that interfere with normal production o collagen or increased production of abnormal collagen fibers or excessive destruction of collagen. The Marfan's, Ehler's- Danlos, Hurler-Hunter's syndromes and mesenchymal defects are predisposing factors for groin hernias.

In smokers, the circulating unopposed enzymes upset the protease / antiprotease system in the blood and bring about destruction of elastin and collagen of rectus sheath, fascia transversalis and cause their attenuation and predispose to herniation.

General factors

Systemic illness, adiposity, lack of exercise, multiple pregnancies, operative incision for gynecological, urological and appendicectomy procedures predisposes to hernia formation.

Recurrent inguinal hernia

Its incidence after primary repair varies from 1% in specialized centers to 30% in general surveys. Most recurrences appear within 2-3 years of primary repair and are called early recurrences due to technical failure and infections. Any recurrences after 2-3 years are called late recurrences and are usually due to tissue failure.

- Suture tension
- Infection
- Absorbable suture material
- Smoking
- COPD
- Chronic constipation
- Collagen disorders
- Failure to ligate the sac at the neck
- Ascites
- Missed hernias
- Repeated repairs
- Silding hernias
- Large and long standing hernias
- General condition of the patient like malnutrition, jaundice, malignant disease etc.

PATHOLOGY

Hernia consists of three parts namely the sac, contents of the sac and coverings of sac

Sac

It is a pouch of peritoneum which comes out through the weakened abdominal musculature and being covered by layers. It is divided into 4 parts.

- Mouth – opening of the sac through which contents enter the sac
- Neck of the sac – most constricted part
- Body-main portion of the sac
- Fundus-most redundant part of sac

Contents of sac

The viscus, which lies within the sac of hernia, is called content. Depending on the content, the hernia is

- Omentocele – content is omentum
- Enterocele – loop of intestine
- Richter's – is a portion of circumference of intestine
- Sliding hernia – portion of bladder, sigmoid colon etc., may slide into hernia
- Litter's hernia – content is Meckel's diverticulum.

Coverings of Sac

Are the layers of the abdominal wall, which cover the hernial sac.

Coverings of the indirect inguinal hernia

From inside out

- Peritoneum
- Extra peritoneal fat
- Internal spermatic fascia
- Cremasteric fascia and muscles
- External spermatic fascia
- Superficial fascia
- Skin

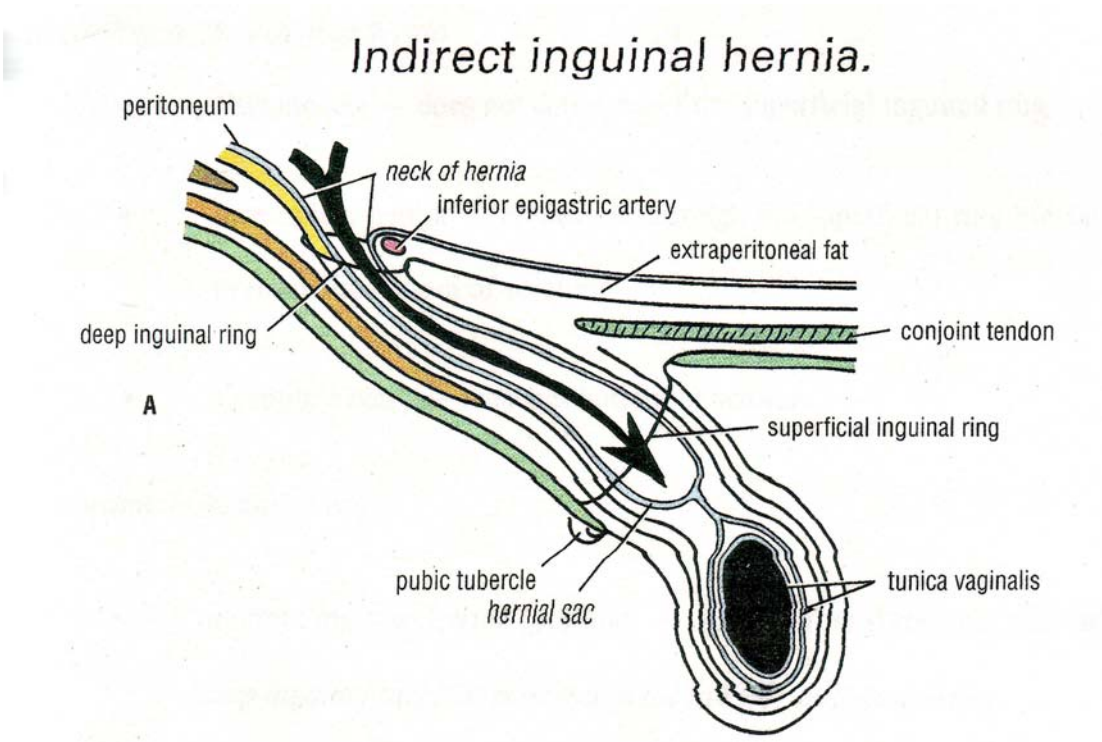
Coverings of direct inguinal hernia

Hasselbach's triangle is divided into medial and lateral halves by the obliterated umbilical artery. A direct hernia leaves this through its outer or inner part.

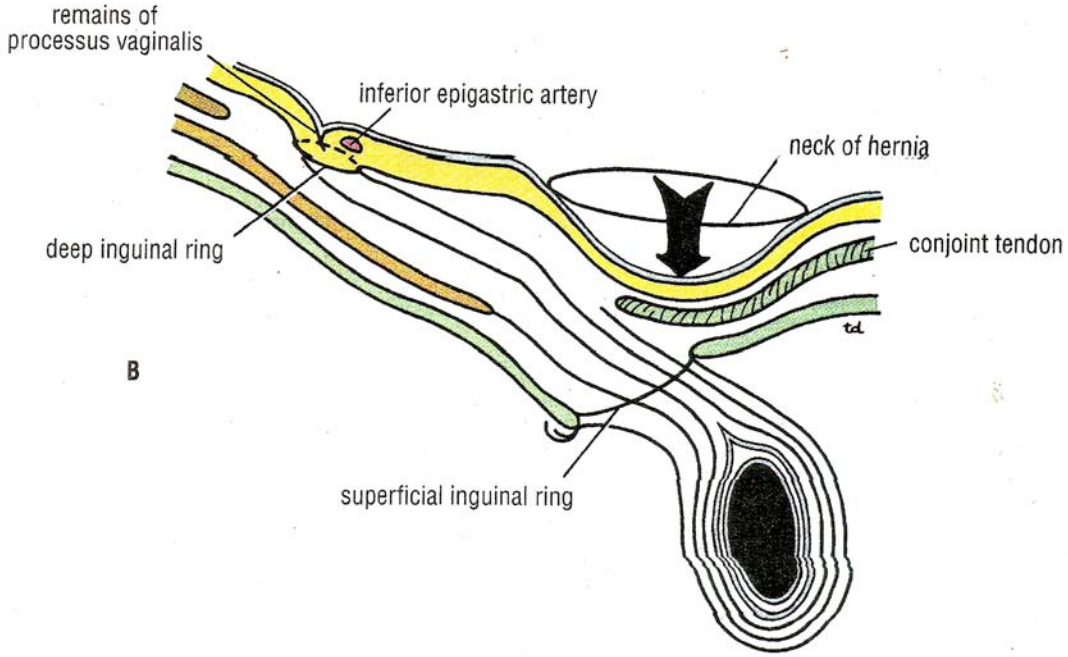
Lateral direct hernia – same as indirect hernia except that, the covering it receives from the fascia transveralis is not that part of the fascia prolonged from the margins of the internal ring. The inferior epigastric artery is lateral to the hernial opening.

Medial direct hernia

- External Spermatic fascia
- Falx inguinalis or conjoined tendon
- Fascia transversalis



Direct inguinal herinia



INVESTIGATIONS

1. Routine investigation

    - Hb% BT, CT
    - Urine examination for albumin, sugar and microcopy.
    - RBS, Blood urea, S. Creatinine.
    - E.C.G.

2. Chest-X-ray PA view – to rule out chronic bronchitis, chronic obstructive pulmonary disease changes / pulmonary tuberculosis and cardiomegaly.

3. Ultrasound of abdomen and groin swelling.

    - To rule out BPH, mass abdomen, hepatosplenomegaly, hydronephrotic without clinical findings.
    - Undetermined palpable masses of the inguinal region.
    - Postoperatively for fluid collections.
    - Treatment of Inguinal hernia

TREATMENT OF INGUINAL HERNIA

Conservative treatment:

Conservative treatment is indicated in patients who are medically unfit and those who postpone or refuse surgery.

Truss :

It does not cure a hernia, with sole exception of newborn infants. A truss basically used to prevent hernia to come out of the superficial inguinal ring.

Indication for truss is :

- Reducible hernia.
- Those who refuse operation.
- In old patients who suffer from chronic bronchitis, enlarged prostate, constipation etc., where surgery even if performed runs the risk of recurrence.
- In children, if properly used continuously for 2 years without allowing the hernia to descend even once during this period, the hernia may be cured by causing adhesions. But it should not be used when there is undescended testis.

Contra indications for truss

- Irreducible hernia.
- Manual labourer.
- Hernia associated with undescended testis.
- Associated with huge hydrocele.
- Patient not aware of placing the truss.

Mode of action

A truss acts by pressing the anterior wall against the posterior wall. It also presses on the deep inguinal ring and prevents hernia to come out. Adhesions gradually develop in the inguinal canal so that the hernia may not find access to come out.

Dangers of using Truss :

- Pressure atrophy of muscles of inguinal region reduces the chance and successful operation at a later date.
- Improper use can lead to obstruction or even strangulation of hernia.
- May induce damage to hernial contents e.g., bowel.
- Adhesion between hernial sac and inguinal canal – is not good for subsequent operation, if required.
- Risk of strangulation.

Method of use

- A truss should be used in lying down position after reducing the hernia completely.
- It should be used throughtout day, except at night. It should be worn again before getting up from the bed.

Operative Treatment

Generally, three type of operations are performed

1. Herniotomy
2. Herniorrhaphy
3. Hernioplasty

Herniotomy

It is indicated in:

- In infants and children.
- In young adults with very good inguinal musculature.

In this operation the neck of sac is transfixed and ligated and then the hernial sac is excised without inguinal canal repair.

The incision is made 1.25 cms above and parallel to the medial 2/3 of inguinal ligament. The subcutaneous tissue is cut along the line of skin incision. The superficial tissue has 2 layers : fascia of camper – the fatty layer and fascia of scarpa the membranous layer. The superficial epigastric and superficial external pudendal vessels ligated and divided. The external oblique aponeurosis is cut upto the superficial inguinal ring, so that whole inguinal canal is exposed.

An incision is made on the cremasteric fascia and internal spermatic fasica. After separating the margins of these fasciae, the white wall of sac will come into view. The sac wall dissected from spermatic cord structures and should be started from the fundus and towards the neck of the sac.

The neck of the sac is identified by :

1. The constriction of the neck of sac.
2. The collar of extraperitoneal fat will be seen when the mouth of the sac widens out to be continuous with the parietal peritoneum.
3. The inferior epigastric vessels seen just medial to the neck of sac in case of indirect hernia and lateral to it in case of direct hernia.

The sac is now opened and the contents are reduced. To make sure a finger is introduced into the sac to see that no contents are adherent to the neck. The neck of the sac is transfixed with absorbable suture and excised above the ligature. The spermatic cord is allowed to fall back to its normal position. The external oblique aponeurosis is sutured in front of cord by continuous absorbable suture. The most medial portion is kept open so that a new superficial inguinal ring is constructed through which the spermatic cord structures emerge.

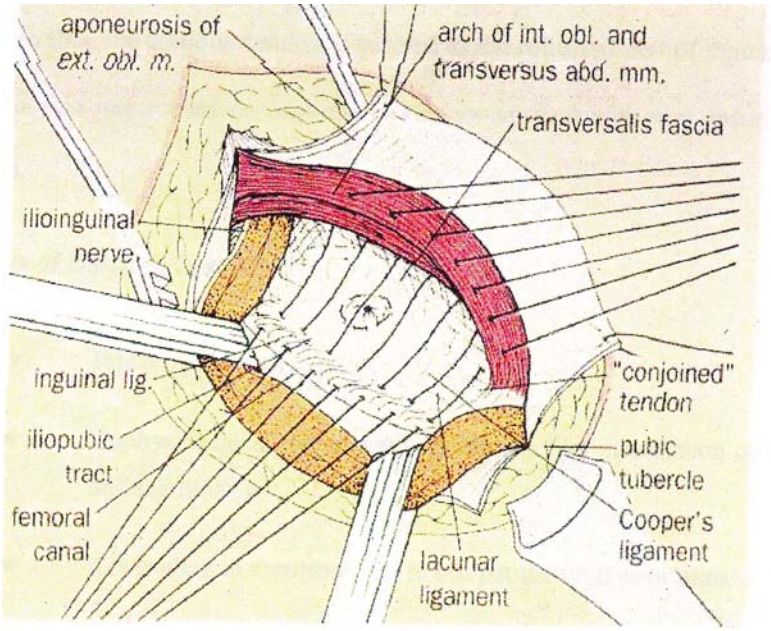
Herniorrhaphy

This means herniotomy and repair of posterior wall of the inguinal canal.

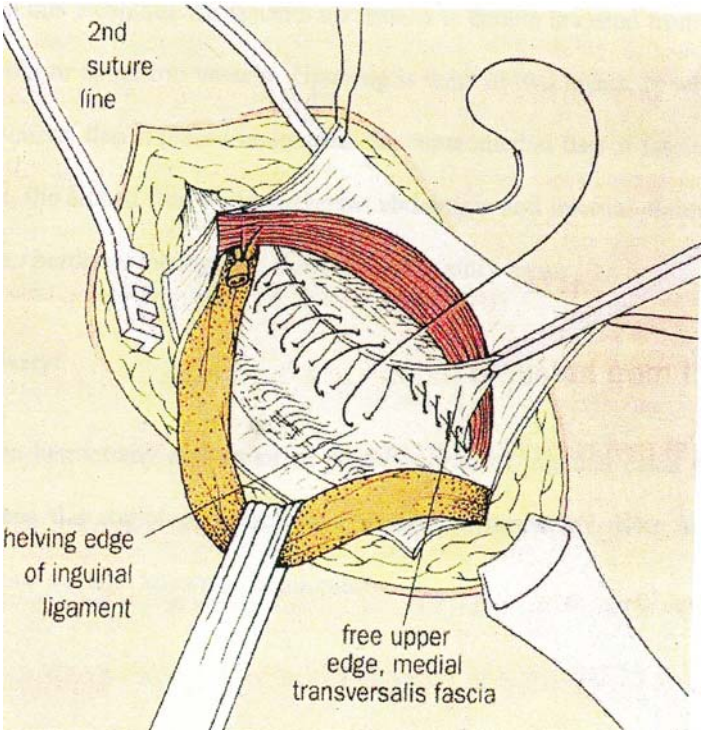
Bassini's Repair

The main aim is strengthen the posterior wall of inguinal canal by stitching the lower margin of internal oblique, transversus abdominis muscle and the transversalis fascia to the inguinal ligament behind the cord. Three to five stitches applied with non-absorbable suture maerial. The most medial suture should be passed through the periosteum of the pubic tubercle instead of passing through the inguinal ligament as this is the part through which most recurrences occur. The most lateral suture is applied to narrow the deep inguinal ring in selected cases. Tanner's muscle slide operation done in case of tension over the sutured line. Here relaxing curved incision is made on the aponeurosis of internal oblique and transversus abdominis.

Bassini's Repair



Shouldice repair



Modified Bassini's repair

In this, the conjoint tendon is sutured to the reflected part of inguinal ligament. Three to five interrupted or continuous stitches applied with non-absorbable suture material.

Demerits of Bassini's Operation:

- It is a repair with tension.
- Unphysiological, interferes with shutter like mechanism of the internal oblique muscle.
- It is useless in recurrent and in old people with poor musculature.

Shouldice repair (Toronto Method)

In this technique the fascia transversalis is double breasted from pubic bone to lateral inferior epigastric vessels. Suturing is done in two layers, in which free edge of inferolateral flap is placed underneath the superomedial flap of fascia transversalis, after this, the arched fibres of transversus abdominis and internal oblique are sutured to the deep border of the inguinal ligament or Bassini's repair.

Hernioplasty:

The herniotomy and repair of posterior wall of inguinal canal by filling the gap between the conjoined muscle and inguinal ligament by using autogenous or heterogenous material known as hernioplasty.

Indications for hernioplasty are

- Direct hernia
- Indirect hernia with poor muscle tone
- Recurrent hernia

Mesh Plug repair:

The plug is preferable to a patch for several reasons. It forms a complete occlusion of the defect without tension. Its slight extension into the preperitoneal cavity prevents the protrusion of omentum or bowel into a culde-sac, that an onlay patch might create. It is a much stronger barrier and can be fixed to small rim of scar tissue.

In indirect inguinal hernia the mesh plug is inserted, tapered end first, through the internal ring and placed into position just beneath the crura. Few anchoring stitches are taken to secure its position. Reinforcement of the repair is done with the onlay mesh patch as an additional measure. Similarly for direct hernia, femoral hernia and recurrent hernias.

The Stoppa Groin Hernia repair; Giant Prosthetic Reinforcement of Visceral sac (GPRVS).

It is the replacement of the fascia transversalis in the groin by a large prosthesis that extends far beyond the myopectenial orifice. The prosthesis envelops the visceral sac held in place by intra abdominal pressure and later by connective tissue in growth. The mesh adheres to the peritoneum and renders it inextensible so that is cannot protrude through the parietal defect. GPRVS is a suture less and tension free repair.

GPRVS via a transabdominal incision directly accesses the properitoneal space of Bogros, Retzius and the parietal defects of hernias without dissection of the inguinal canal, spermatic cord and sensory nerves of the groin. It is especially suited for recurrent

groin hernias because it minimizes the risk of complication – testicular atrophy and chronic neuralgia.

Meshes used in the GPRVS- Mersilene (Dacron), Polypropylene mesh, Goretex etc.

Bilateral GPRVS may be achieved through a subumbilical midline of pfannenstiel incision. Cleavage plane created in the properitoneal space and extends downward in front of the bladder, prostatic fossa and behind the iliopubic ramus in the space of Bogros, laterally iliopsoas muscle and external iliac vessels, superiorly the line of Douglas.

Mesh dimension – transverse dimension is equal to the distance between the anterior superior iliac spines minus 2 cms and vertical dimension is equal to distance between the umbilicus and pubic symphysis. The upper margin is cut to chevron shape to conform line of Douglas.

Variants of GPRVS are unilateral GPRVS and transinguinal GPRVS.

The indications for the GPRVS are :

- Complex hernias such as bilateral groin defects or unilateral groin hernia with lower abdominal eventrations.
- Complicated hernia such as silding inguinal and recurrent hernias.
- Intrinsic tissue collagen defects.
- The repair of recurrent and re-recurrent groin hernias.

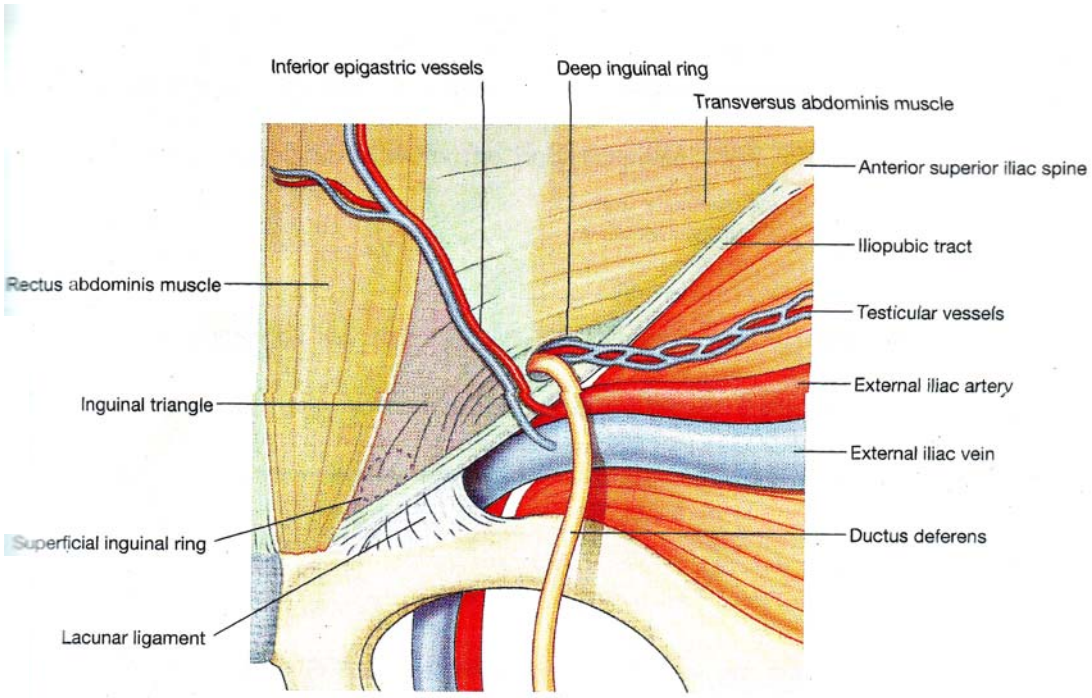
Laparoscopic Repair

Transabdominal Preperitoneal Repair (TAPP)

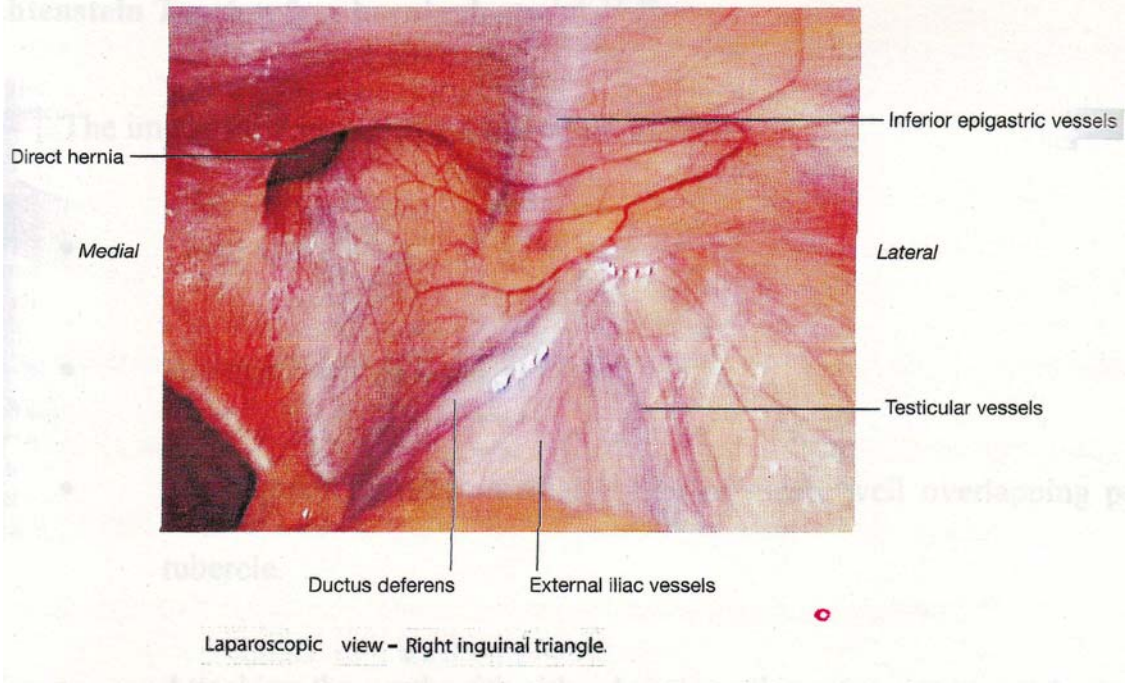
The peritoneum is incised cephalad to the inguinal floor, and hernia defects are dissected. Preperitoneal space is entered from the peritoneal cavity side. Mesh is spread out in the space and secured to Cooper's ligament and the underside of conjoint tendon. No staples being placed lateral to the epigastric vessels to avoid nerve injury.

Intraperitoneal Onlay Mesh Repair (IPOM)

Here the polypropylene mesh is placed in the inner aspect of peritoneum and is in contact with viscera. It carries the risk of adhesion, mesh erosion into bowel, etc, Polytetrafloroethylene mesh is the least adherent one.



Right inguinal triangle Internal view.



Laparoscopic view – Right inguinal triangle.

Totally extra peritoneal repair (TEP)

In this method, the peritoneum is not breached, prepeeritoneal space is entered directly from skin and wherein the polypropylene mesh placed and secured to ligaments.

Complications include testicular atrophy, nerve entrapment, vascular injury, visceral injury, pneumoperitoneum associated systemic complication, infection of mesh and thereby its judicious removal, recurrences etc. All these are more during "learning curve" stage .

Laparoscopic TEP herniorrhaphy is indicated in patients with recurrent hernias, bilateral hernias, and unilateral hernias with a suspected contralateral hernia. It is preferable because of its lower complication, decreased recurrence rate. TAPP is reserved for patients for recurrent hernias.

Lichtenstein Tension free hernioplasty

The important features of the operation include

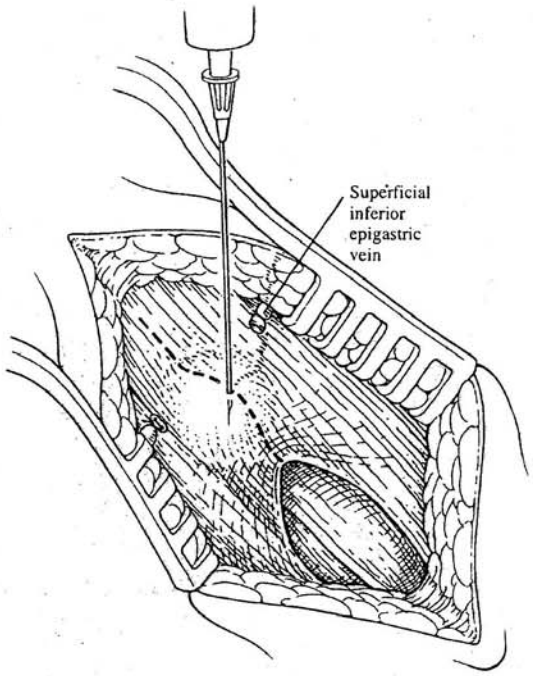
- Local anaesthesia
- Adequate size of mesh
- Attachment of infero-medial corner of mesh, well overlapping pubic tubercle.
- Attaching the mesh with either loose continuous or interrupted sutures, (tight suturing leads to tissue necrosis and pain)
- Overlapping lateral tails of mesh to provide a snug fit around the cord.
- Encouragement of early mobilization.

Technique of Anaesthesia

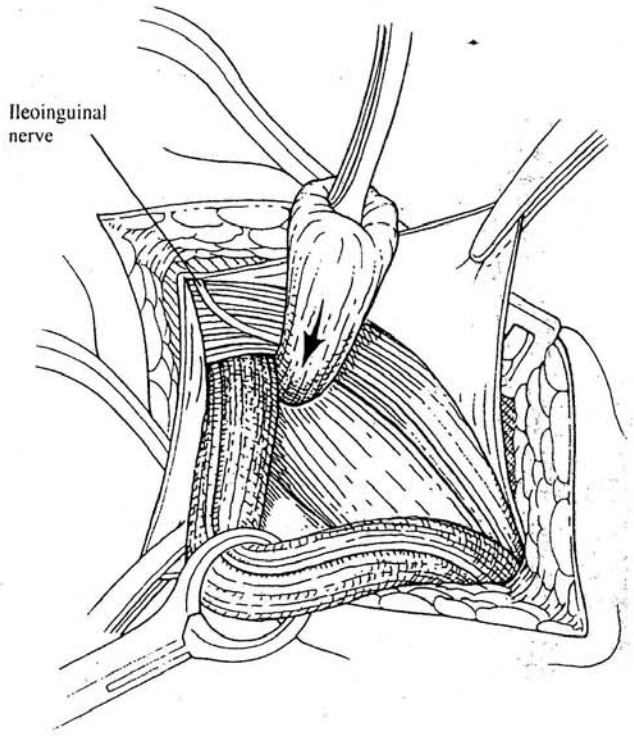
Local anaesthesia is preferred for all reducible adult inguinal hernias. It is simple, cost effective, administered prior to incision and produces a prolonged analgesic effect.

Local anaesthesia consists of 0.5% lignocaine and 0.25% bupivacaine. An average of 45 ml is usually sufficient for unilateral hernia repair About 5ml of mixture infiltrated along the along the line of incision, with 5cm long 25-gauge needle inserted into the subdermal tissue parallel with surface of skin. Infiltration continue as the needle is advanced. This steps blocks the subdemal nerve endings and reduces discomfort of intradermal infiltration. The needle in subdermal plane withdrawn slowly until the tip of needle reaches the intradermic level. Without extracting the needle completely, dermis is infiltrated slowly with 3 ml of mixture along the line of incision.

About 10ml of mixture is injected deep into subcutaneous adipose tissue through vertical insertions of needle 2 cm apart. 10ml of anaesthetic mixture injected immediately underneath the aponeurosis of external oblique muscle through a window created in subcutaneous fat at the lateral corner of incision. This injection floods the enclosed inguinal canal and anaesthetizes all the three major nerves in the region, while the remaining subcutaneous fat is incised. It also reduces ilioingunial nerve injury when external oblique oponeurosis is incised and sometimes, it is necessary to infiltrate at the level of pubic tubercle, around neck and inside the indirect sac to achieve complete local anaeshesia.



Instilling 5–10 mL of dilute local anesthetic beneath the unopened external oblique aponeurosis - flooding technique



Inverting the unopened indirect sac, having freed the margins of the neck completely at the deep ring.

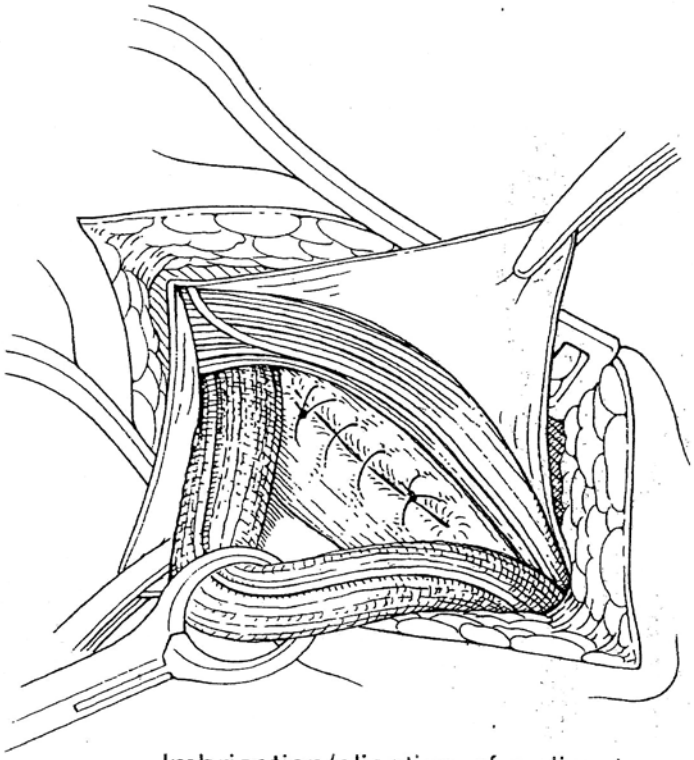
The anaesthesia can be further prolonged by splashing 10ml of mixture into the inguinal canal before closure of external oblique aponeurosis and in subcutaneous space before skin closure.

Operative Technique

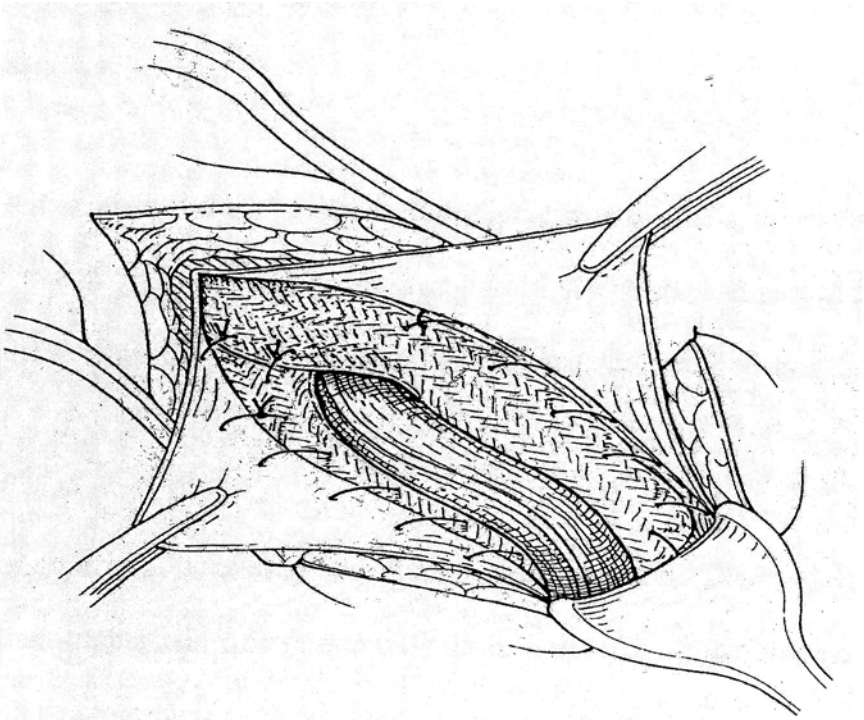
A transverse skin crease incision, which starts from pubic tubercle and extends laterally within langer's lines, gives an excellent exposure of pubic tubercle and internal ring. The external oblique aponeurosis is opened and its lower leaf freed from spermatic cord. The upper leaf of external oblique is freed from under lying internal oblique muscle and aponeurosis for a distance of 3 cm above the inguinal floor.

The cord with the coverings is separated from the inguinal floor and pubic bone for a distance of 2 cm beyond the pubic tubercle. When lifting the cord care should be taken to include, ilioinguinal nerve, external spermatic vessels and genital nerve with the cord.

To explore the internal ring for indirect hernia sacs, the cremasteric sheath is incised longitudinally at deep ring. Complete stripping and excision of cremasteric fibres is unnecessary and can result in injury to the nerves, small blood vessels and vasdeferens. The sacs are dissected from the cord up to extraperitoneal and then either excised or inverted. High dissection rather than high ligation is important feature of this stage. The inguino scrotal sacs are transected in midinguinal canal, the proximal parts closed and distal portion is left undissected and wide open. In the event of large hernias, the sacs are inverted with an absorbable suture.



Imbrication/plication of a direct sac



Tails of the mesh encircling the spermatic cord.

A sheet of 8x16 cms of polypropylene mesh is used. The monofilament prolene mesh pomotes fibroplasia and does not produce infection. The medial end of the mesh is cut to the shape of medial corner of inguinal canal. With the cord retracted upwards, the inferomedial corner of the mesh is sutured to the soft tissues overlying the pubic tubercle using polypropylene suture. This is an important step in the repair because failure to cover this bone with mesh can result in recurrence. The periosteum of bone is avoided. The suture is continuous with not more than 3 to 4 passes, to attach the lower edge of mesh to inguinal ligament up to a point just lateral to internal ring. Suturing the mesh beyond this point is unnecessary and could injure the femoral nerve.

A slit is made at the lateral end of mesh, creating two tails, upper (two thirds) and lower (one third). The upper tail is grasped with haemostat and passed toward the head of patient below the spermatic cord; this positions the cord between the two tails of mesh.

The upper tail is crossed and placed over lower tail. The cord is retracted downward and upper leaf of external oblique upward. The upper edge of mesh is sutured with two interrupted sutures, one to rectus sheath and other to internal oblique aponeurosis just lateral to the internal ring. Upward retraction of upper leaf of external oblique during this phase of repair is important because it results in appropriate amount of laxity (in a dome like configuration) for the patch when retraction is released. The laxity assures a tension free repair and is taken up when the patients strains on command during the operation or resumes an upright position. More importantly, it compensates for future shrinkage of mesh, which is approximately 20%.

With a single non-absorbable monofilamented suture, the lower edges of each of the two tails are fixed to the inguinal ligament just lateral to the completion knot of lower running suture. This creates a new internal ring made of mesh. The crossing of two tails produces a configuration similar to that of normal transversalis fascia sling, which is assumed to be largely responsible for the normal integrity of internal ring. In addition, it results in creation of dome like tenting of mesh in this area and assures a tension free repair of internal ring area.

The excess mesh on lateral side is trimmed leaving at least 5cm beyond internal ring. This is tucked underneath the external oblique aponeurosis which is then closed over the cord with an absorbable suture. Fixation of tails of mesh to internal oblique, lateral to the internal ring, is unnecessary and could result in entrapment of ilioinguinal nerve with the fixation suture.

Out come measures

Many authors from Europe and United States reported that the results of open tension free hemioplsty are measured by postoperative pain, return to work, recurrence rate and complications.

Post –operative pain

The open tension free mesh repair of inguinal hernia hernia results in minimal postoperative pain, requiring only moderate oral analgesic for a period of 1 to 4 days which results in a faster recovery.

Return to work

Return to work after tension free hernioplsty is between 2 and 14 days depending on the patient's occupation. In bilateral inguinal hernia repair, it is 2 days longer than unilateral repair.

Recurrence Rate

The recurrence for this procedure is less than 1% Recurrences occur as a result of technical failure.

Complications

Infection, haematoma and seroma occur in approximately 1% of cases. The serious complications with this technique chronic neuralgia and testicular atrophy, which occurs in a fraction of 1%.

Technical Consideration.

The recurrence rate is reduced by using a wide piece of mesh to overlap tissues beyond the boundary of Hasselbach's triangle for 3 to 4 cms. After incorporation, this overlap results in uniform distribution of intra-abdominal pressure over the much wider surface of the overlapped area. More importantly, it compensates for future shrinkage of the mesh. Placement of the mesh over the inguinal floor and behind the external oblique aponeurosis uses the intra – abdominal pressure in favour of the repair. Contraction of the external oblique keeps the mesh tightly in place by acting as an external support when intra-abdominal pressure rises with straining. Proper fixation of the margins of the mesh to the groin tissues is another important step in the prevention of recurrence. In mobile areas such as the groin, there is a tendency for the mesh to fold, wrinkle or curl around

the cord. Even the slightest movement of the mesh from the pubic tubercle, inguinal ligament or the area of internal ring is a leading cause of failure of mesh repair of inguinal hernias.

Adequate laxity of the mesh must be allowed during fixation to totally eliminate tension and compensate for increased intra-abdominal pressure when the patient stands or strains and for contraction of mesh, which is 20% after implantation.

Variation in technique

Without using a continuous suture, but simply tacking the piece of mesh at four or five points at its periphery is a variation of this technique. Some surgeons varied the shape of mesh and altered the way the tails of the mesh encircle the spermatic cord. These minor variations are inevitable and are a form of continuous improvement, however they are acceptable only if the basic principles of the operations are not violated.

The Ideal Prosthesis

Cumberland and Scales, in 1950 developed eight criteria for an ideal biomaterial. Theses have been enumerated by Hamer-Hodes and Scott.

The material should

- Not be physically modified by tissue fluids
- Be chemically inert
- Not excite an inflammatory or foreign body reaction
- Not produce a state of allergy or hypersensitivity
- Be capable of resisting mechanical strains

- Be capable of being fabricated in the form required
- Be capable of being sterilized.

Future biomaterials must meet three more criteria.

- They must be resistant to infection
- They must provide a barrier to adhesions on side of material placed adjacent to viscera.
- They must respond like an autologous tissue and allow tissue incorporation for good fixation.

Polypropylene Mesh

Polypropylene (-CH2-CH (CH3)-)n) is a thermoplast based on propane with a molecular weight of 100,000. It is supposed to resist physical decay even after years of being implanted. Filaments made of this have a similar strength to steel, although they are only one eight the density of iron.

The disadvantage is the high bending stiffness of the monofilaments which can increase even during implantation. This polymer initiates (sub) acute inflammatory reaction of the host tissue with a consequent fibrosis and high mechanical stability after implantation.

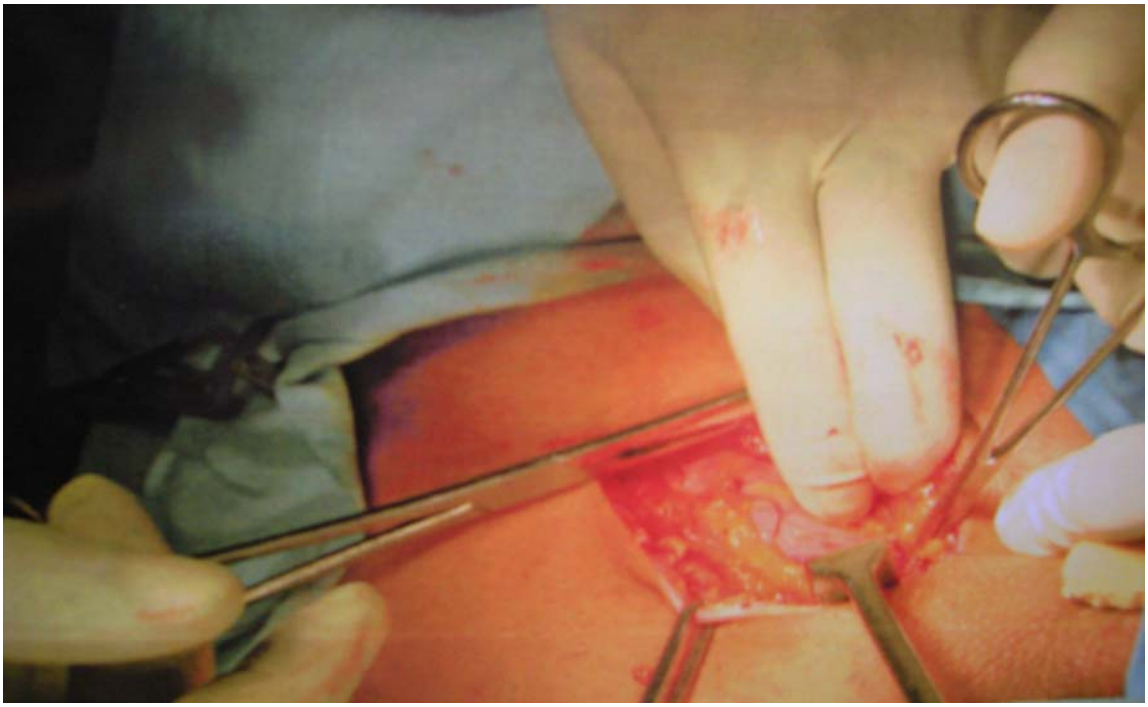
As a result of physiological wound contraction depending largely on the extent of inflammation, the polypropylene meshes show a considerable shrinkage of about 20% in length. These meshes regularly cause the development of edema around the implant, so that drainage for 2 to 7 days is usually advisable.

Predominantly these meshes are used for several techniques of inguinal hernia repair usually with excellent results and recurrence rate less than 1%. In case of infection, it is recommended that a monofilament mesh may be left in place and the infection treated with antibiotics.

Polypropylene mesh (prolene) made an enormous impact in surgical field and many patients are benefited by its application in numerous surgical problems. It is an ideal popular prosthetic material available today for surgical implantation.

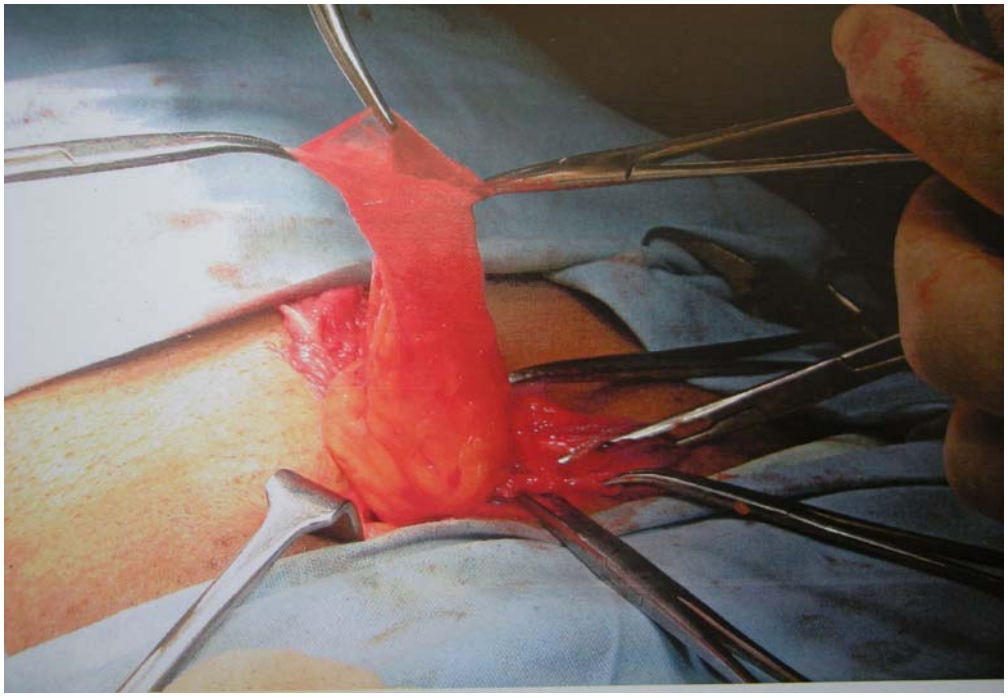
Principles of Mesh Repair

The surgical meshes induce an inflammatory foreign body reaction resulting in an intense fibrosis in non-absorbable mesh filaments as a mechanical – sealing mechanism, and an embedding collagen-rich scar tissue. These components form a mechanical and stable artificial abdominal wall.

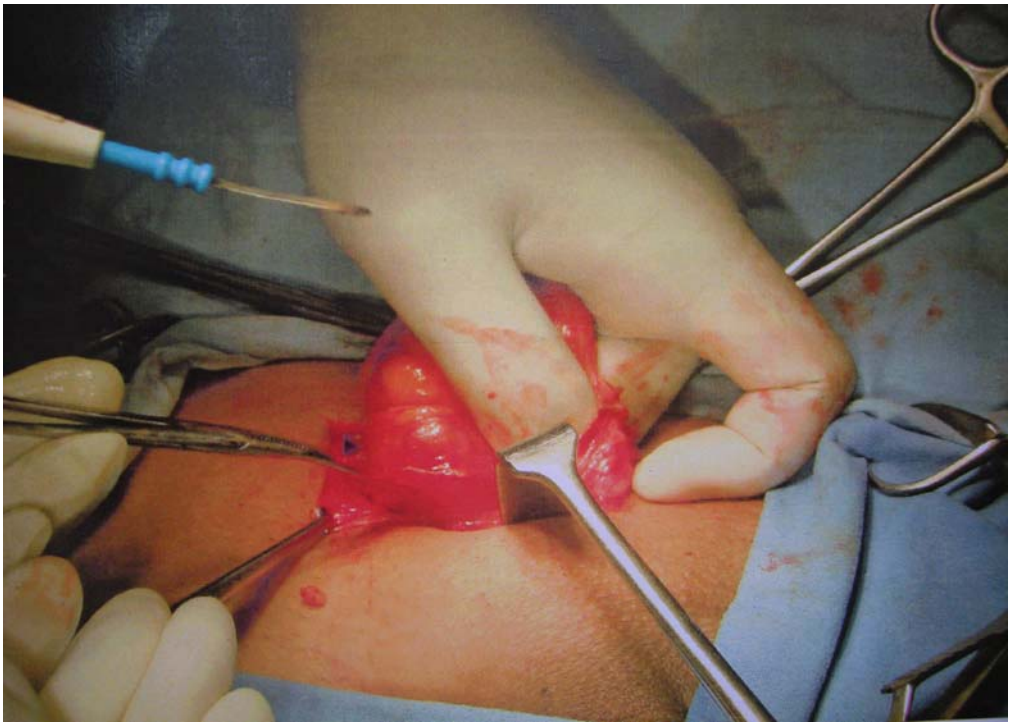


Picture showing exposure of superficial fascia

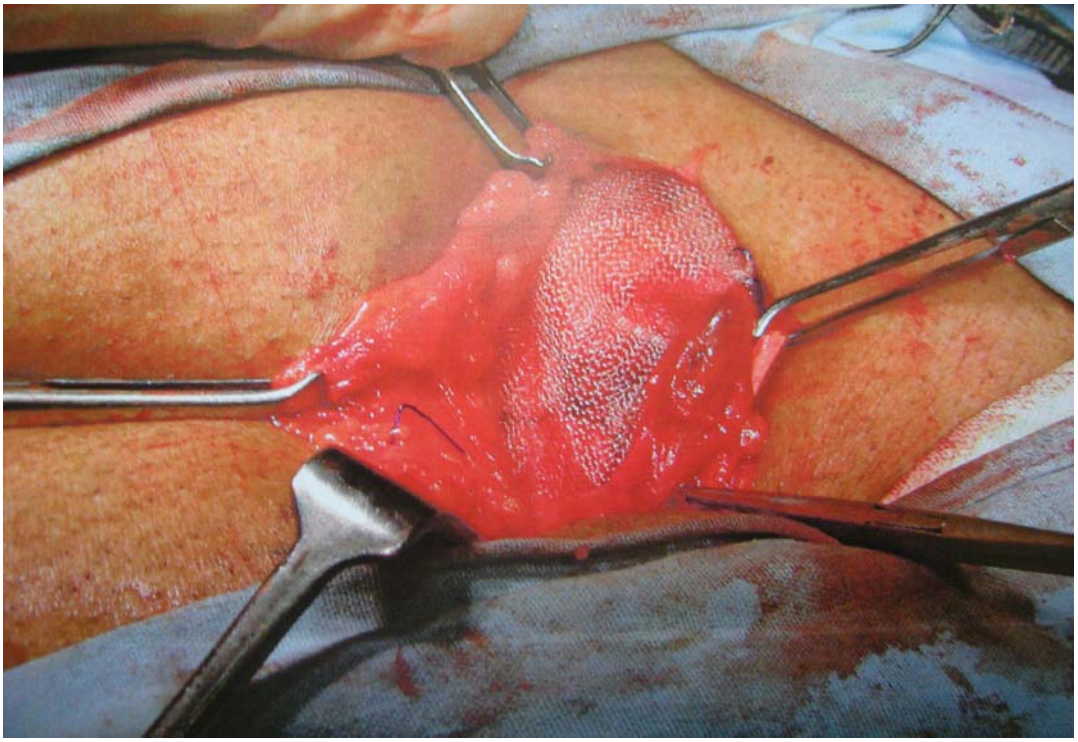
Picture showing skeletonization of spermatic cord



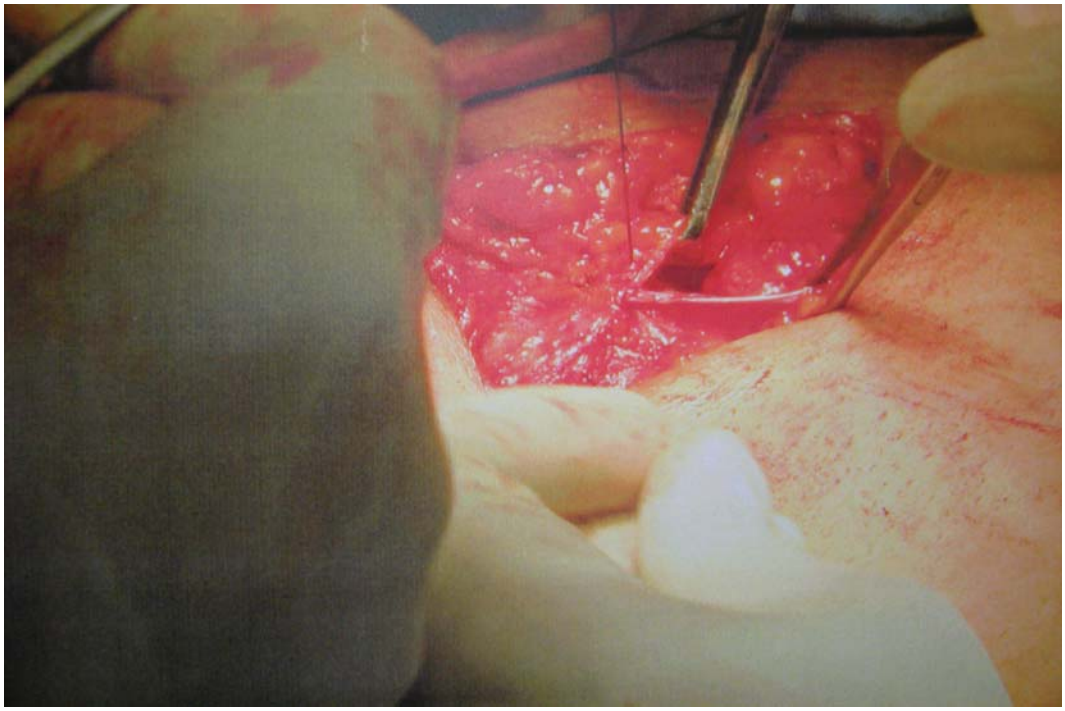
Picture showing opening of indirect Sac



Picture showing Direct Sac



Picture showing fixation of mesh



Picture showing closure of external oblique aponeurosis over the spermatic cord

COMPLICATIONS OF INGUINAL HERNIA REPAIR

General Complications

Urinary retention, paralytic ileus, nausea and vomiting, aspiration pneumonia, cardiovascular and respiratory insufficiency.

Local Complications

- Haemorrhage
- Ecchymosis around the skin incision
- Scrotal haematoma

Infection

Diabetes mellitus, renal filure, alcoholism, malnutrition and obesity increase the infection rates. It is the main cause for recurrence of hernias.

The staphylococcus aureus, staphylococcus epidermidis and E. coli are the most common pathogens to be encountered in elective inguinal hernia repairs.

Wound infection varies from the minor redness of skin edges, serous discharge, and stitch abscess to the more serious cellulitis in and around wound that may progress to necrotizing fascitis.

Bladder injury : Occurs when dissecting the large direct sac.

Cord and Testicular complications

Hydrocele

This occurs especially if the distal sac is ligated, but if the distal sac is left unclosed, the incidence decreases. It brilliantly transilluminates.

Haematocele

It is a collection of blood in the distal sac in patients with a patent processus. There is a swelling of the cord and scrotum with associated pain. The source of the bleeding in these patients is either from the cut edges of the distal sac, from the testicular artery or from the pampiniform plexus of veins.

Ischaemic orchitis and Testicular Atrophy

Ischaemic orchitis is insidious in onset and become obvious between 2 and 5 days post operatively. The patients complain of pain, swelling and on examination a hard tender cord, epididymis and testis are found. The testis is also retracted upward in the scrotum. The pain and tenderness lasts for several weeks.

The ischaemic orchitis may subside completely without any residual damage to the testicle, but in some patients testicular atrophy occurs. It is important that the patient is reassessed periodically for at least for 1 year, because atrophy may become apparent during that time.

Extensive dissection within the cord and the cremaster for removal of the sac of the hernia damages the venous plexus and the venous blood flow. Division of the sac

without removal of the distal sac decreases the incidence of ischaemic orchitis and subsequent testicular atrophy.

Vas deferens injury

Dysejaculation syndrome results from trauma to the vas during surgery and it results in scarring and narrowing of the lumen of the vas. The patient experiences a searing, burning pain sensation throughout the groin at the time of ejaculation.

Transection usually occurs in open repairs, particularly in recurrent herniorrhaphy.

Bowel injury : Small and large bowel (caecum or sigmoid) injury occurs when they form part of wall of a sliding hernia.

Nerve injury : There are four types of neuralgias

(i) Neuroma pain : Common type, caused by proliferation of nerve fibres outside the neurilemma following complete or partial nerve dissection. Pain is like an electric shock.

(ii) Deafferntiation pain : A burning pain following complete or partial nerve section or entrapment in a ligature.

(iii) Projected pain : Intact nerve nerve encased in a callus or entrapped in ligature.

(iv) Referred pain : The lesions are at a distance, such as an inflammatory granuloma around a suture or the stump of a peritoneal sac.

Bone – osteitis pubis as a result of periosteal bite taken at the pubic tubercle.

Post herniorrhaphy paravesical granulomas

A palpable mass close to the urinary bladder caused by foreign body reaction to suture used in the repair of an inguinal hernia.

Recurrences

Remains the most common complication of hernia surgery and ranges from 2.3% to 20% for inguinal hernias.

Mesh related complications

During the first few days after implantation of meshes a collection of liquid around the mesh can be detected by ultrasound. These extended seromas are caused by destruction of lymphatic vessels, and they reflect as well the inflammatory potency of the alloplastic material. At the same time, the patient's body temperature shows a slight increase to 38.0 ± 0.3^0C after implantation of large pieces of mesh. Correspondingly a rise of C-reactive protein indicates an acute inflammatory process. The spread of inflammation to adjacent structure is confirmed by CT, ultrasound revealing a thickened spermatic cord after implantation of meshes in the inguinal region.

Clinically apparent extent of inflammatory response shows remarkable variations between patients.

Infection

Studies have demonstrated that the implantation of meshes does not icrease the risk of infection. With or without mesh, the infection rate varies between 1% to 5%

Mesh Shrinkage

The extent of mesh shrinkage as a result of physiological wound contraction reflects mainly the activity of the inflammatory reaction. Animal experiments have confirmed that for heavy weight prolene meshes, a reduction of mesh area of about 40% after 6 weeks is seen, where as the shrinkage seems to be less for light weight meshes.

Mesh related complaints

Mesh implantation not only strengthens the abdominal wall but sometimes leads to a considerable restriction of the abdominal wall mobility as well as to a high rate of complaints in upto 50% of all patients, particularly after implantation of a large piece of mesh.

Mesh migration and fistula formation

The migration of a mesh with the formation of the fistula mostly occurring to bowels and bladder is a serious complication of mesh surgery.

Right Recurrent Inguinal hernia with Wound infection

Left Recurrent Inguinal hernia

MATERIALS AND METHODS

Government Rajaji Hospital is a tertiary care centre in Madurai, Tamilnadu. It has the privilege of having maximum number of outpatients in south Tamilnadu .

Hernia is one of the surgical problems presenting to our everyday outpatient department. The common surgical interventions done are modified bassini's repair, shouldice repair and lichtenstein tension free hernioplasty.

A study of comparison of complications following the above mesh and tissue repair was conduted on 80 inguinal hernia patients of whom 40 patient underwent tissue repair and 40 patient underwent mesh repair.

Duration of study was from September 2006 to September 2008. Patients were included in the study based on inclusion and exclusion criteria.

Inclusion Criteria:

1. Direct inguinal hernia
2. Indirect inguinal hernia
3. Bilateral inguinal hernias.

Exclusion criteria :

1. Strangulated inguinal hernias
2. obstructed inguinal hernias
3. recurrent inguinal hernias.

Diagnosis was done based on clinical findings and the investigations were done to obtain fitness for surgery. They are Hb%, BT, CT, urine examination for sugar, albumin and microscopy, random blood sugar, blood urea, serum creatinine, chest xray, ECG and ultrasound abdomen and groin swelling.

Pre-operative antibiotics were administered to all the patients. In most of the cases, spinal anaesthesia was used and in some cases local anaesthesia was used.

Of the 80 patients chosen for the study, 40 patients underwent mesh repair by Lichtenstein's hernioplasty and 3 among 40 with bilateral hernia underwent stoppa's procedure and 40 patients underwent tissue repair by modified bassini's technique.

Early post-operative complications like pain, urinary retention, infection, seroma, haematoma, ischemic orchitis and secondary hydrocele and osteitis pubis were looked for.

Follow-up was done at outpatient department at 3 months, 6 months and 1 year to look for late complications like chronic groin pain and recurrent hernia and mesh infection or rejection.

RESULTS

Table 1. Age wise distribution

Age in years	No. of cases underwent		Percentage	
	Mesh repair	Tissue repair	Mesh repair	Tissue repair
15 – 20	--	17	--	42.5
21 – 30	2	13	5	32.5
31 – 40	10	10	25	25
41 – 50	14	--	35	--
51 – 60	10	--	25	--
61 – 70	4	--	10	--
Total	40	40	100	100

Chart 1. Age wise distribution

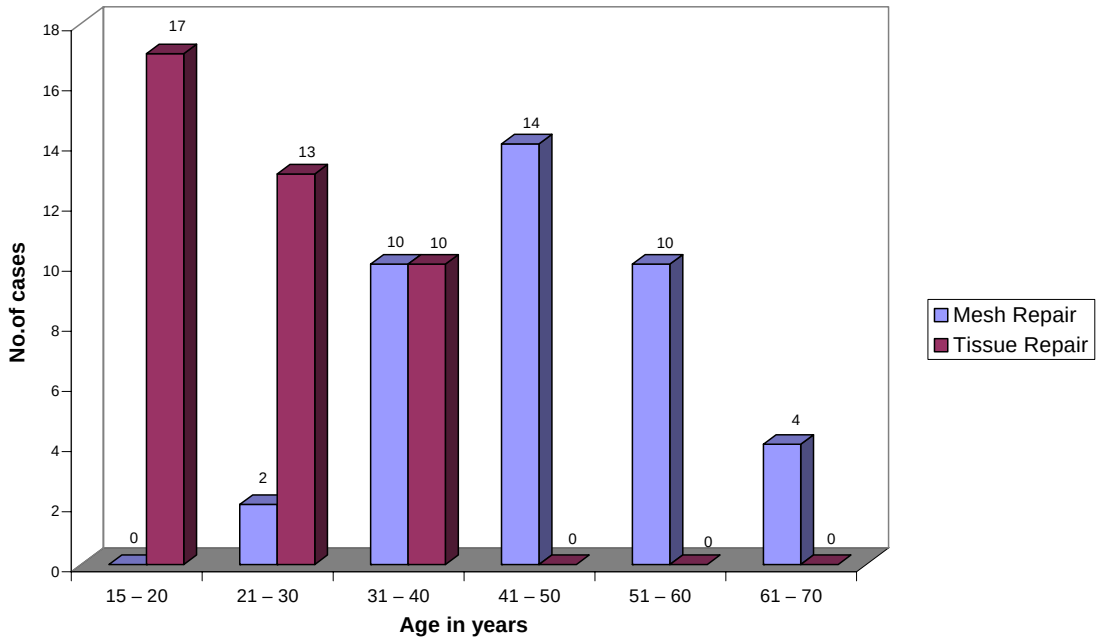


Table 2. Sex distribution

Sex	No. of cases	Percentage
Male	79	98.75
Female	1	1.25
Total	80	100

Chart 2. Sex distribution

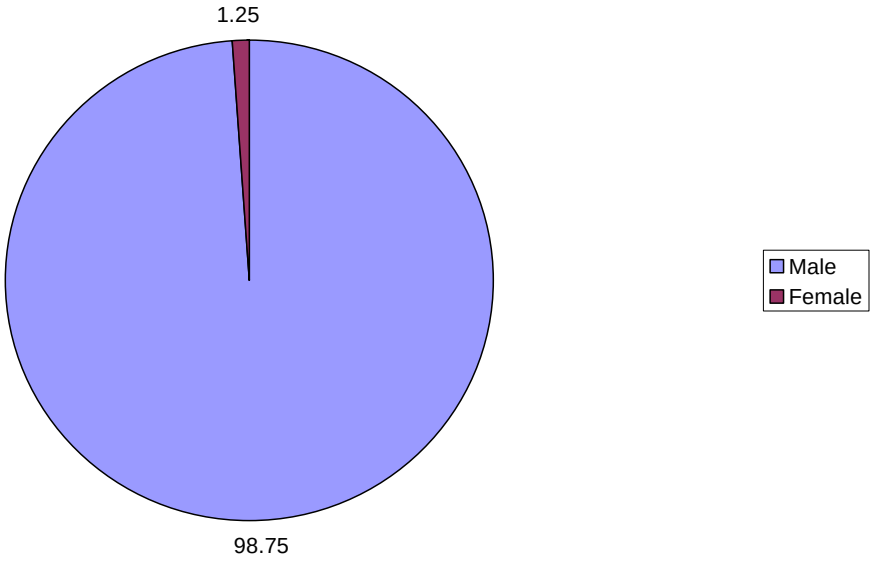


Table 3. Type of hernia

Type	No. of cases	Percentage
Direct	18	22.5
Indirect	59	73.75
Both	3	3.75

Chart 3. Type of hernia

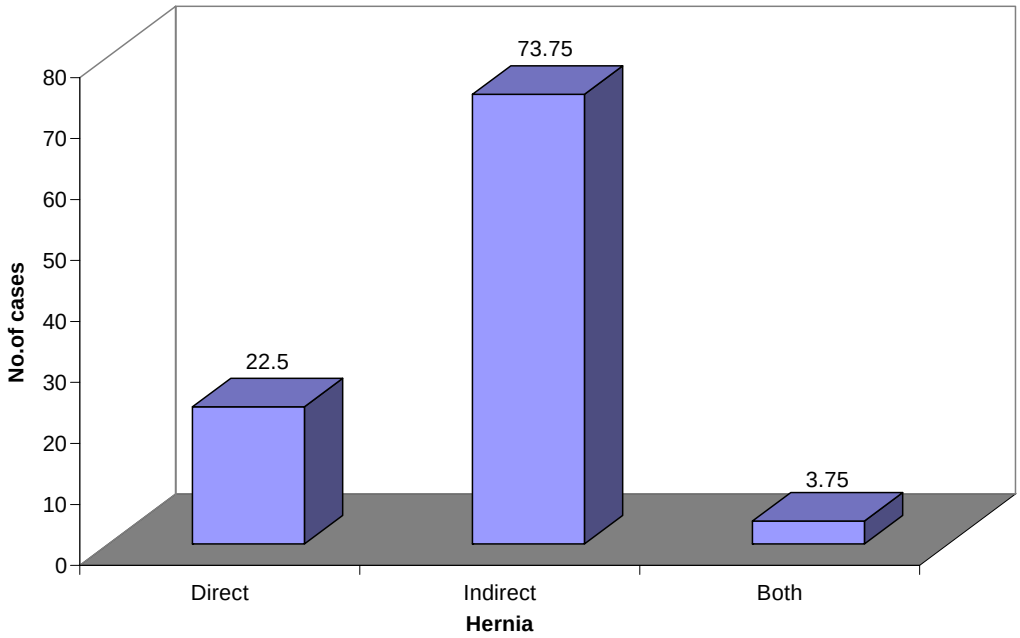


Table 4. Side of the hernia

Side	No. of cases	Percentage
Right	43	53.75
Left	29	36.25
Bilateral	08	10
Total	80	100

Chart 4. Side of the hernia

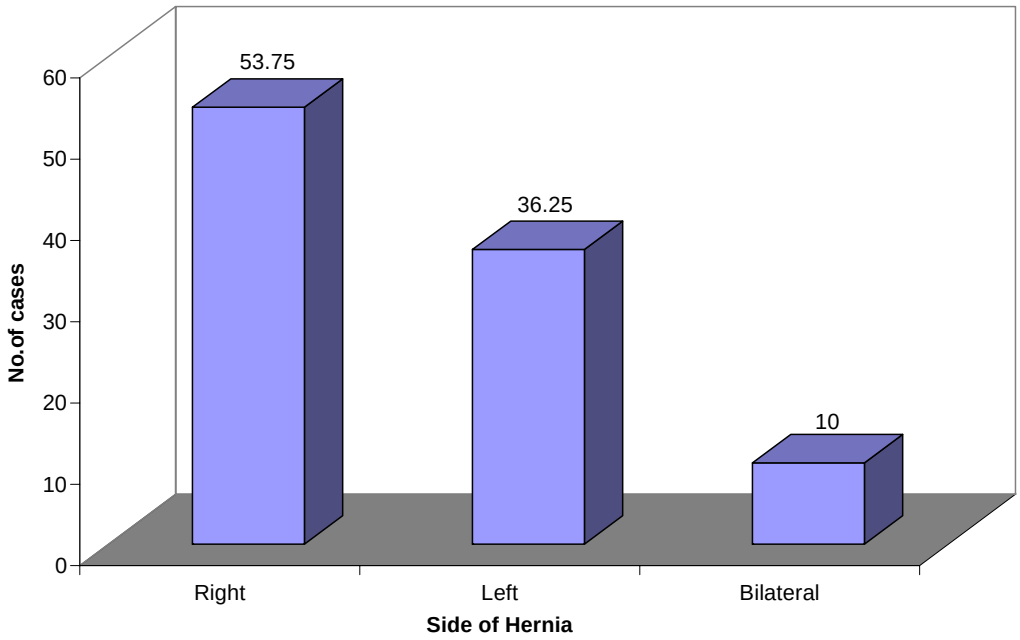


Table 5. Duration of hernia

Duration	No. of cases	Percentage
< 6 months	29	36.25
6 – 12 months	20	25
1 – 5 years	22	27.5
5 – 10 years	5	6.25
> 10 years	4	5
Total	80	100

Chart 5. Duration of hernia

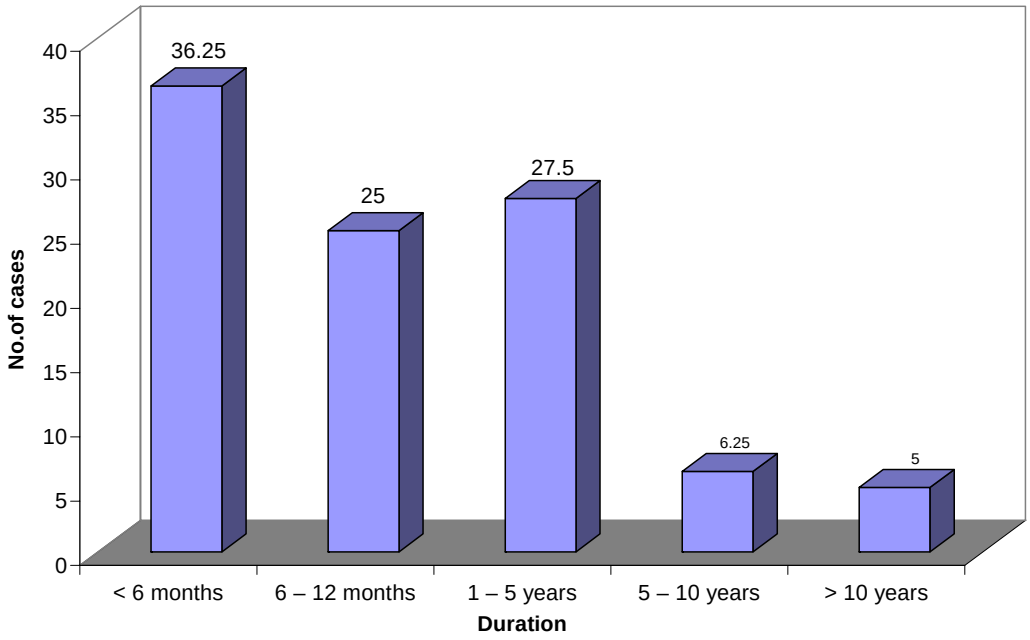


Table 6. Early complications

Complications	No. of cases underwent		Percentage	
	Mesh repair	Tissue repair	Mesh repair	Tissue repair
Pain	5	20	12.5	50
Urinary retention	2	6	5	15
Infection	3	4	7.5	10
Haematoma	--	--	--	--
Seroma	3	1	7.5	2.5
Ischemic orchitis	--	--	--	--
Sec hydrocele	--	--	--	--
Osteitis pubis	--	3	--	7.5

Chart 6. Early complications

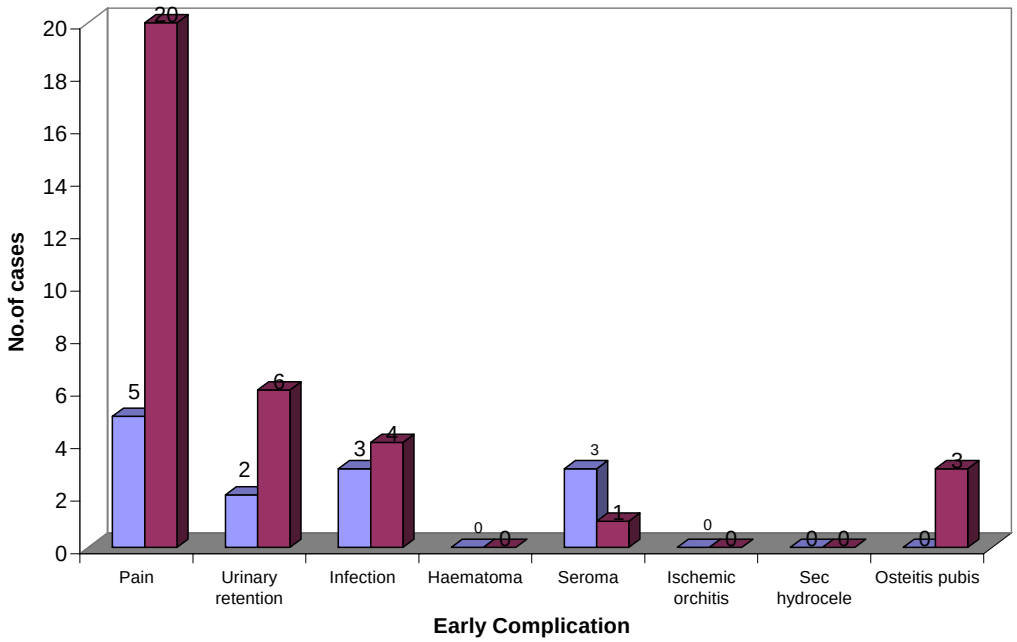


Table 7. Late Complications

Complications	No. of cases underwent		Percentage	
	Mesh repair	Tissue repair	Mesh repair	Tissue repair
Chronic groin pain	2	5	5	12.5
Recurrences	1	3	2.5	7.5

Chart 7. Late Complications

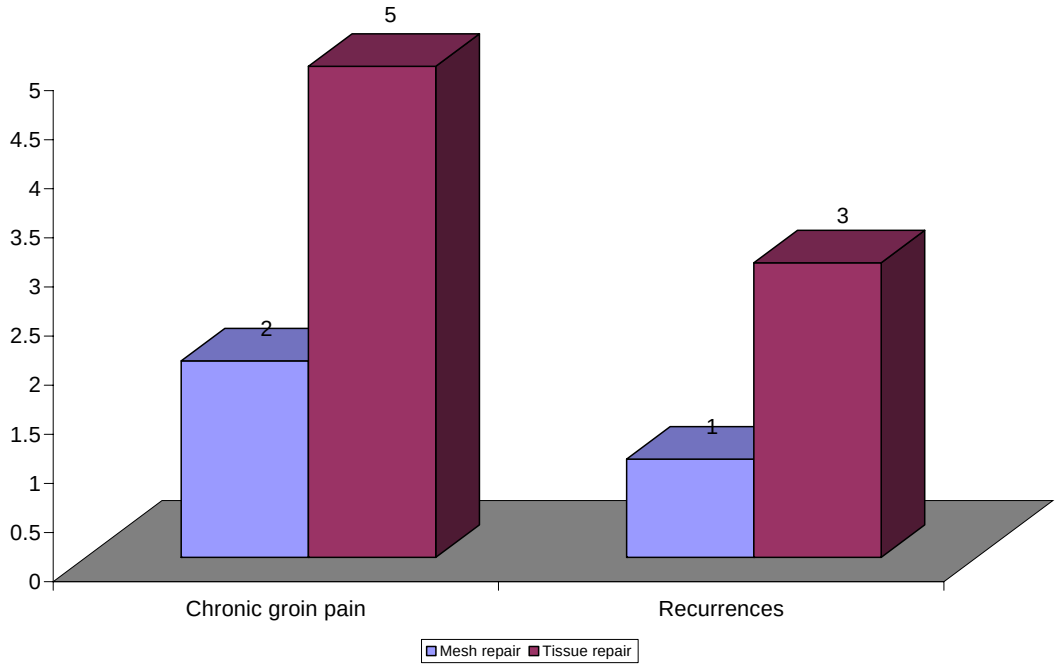


Table 8.Comparison of Complications in mesh Vs tissue repair by chi-square test

Treatment	Early & late complication			Total
	No complication	Early complication	Late complication	
Mesh repair	23	15	2	40
	69.7	39.5	22.2	50.0%
Non-mesh repair	10	23	7	40
	30.3	60.5	77.8	50.0%
Total	33	38	9	80
	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.583	2	.008

DISCUSSION

Age (Table 1)

Inguinal hernia can occur at any age but incidence increases as age increases. In our patients age ranged from 15 to 70 years. More than 45 percent over 31 years. The maximum incidence was in the age group of 31-40 years (25%).

Sex (Table – 2)

In this study, the incidence of inguinal hernia in males is 98.75% (79) and in females 1.25% (1).

The incidence of hernia is common in males to the extent of 25% in their life time, whereas in females it is just 2%. The descent of testis into the scrotum has made males to be prone for herniation. Females have relatively strong inguinal cannal as ovaries will not descend out explains the rare incidence of inguinal hernia in females.

Type of Hernia (Table 3):

In 80 cases studied 59 cases were of indirect inguinal hernias (73.75%). 18 cases were direct inguinal hernias (22.5%) and 3 were pantaloon hernia (3.75%).

Indirect inguinal hernias are more common and constitutes about two third of the inguinal hernias, whereas direct hernias are less common and constitutes about 15% of all cases.

Table 4. Side of hernia:

Inguinal hernias occur more common on the right side due to delay in descent of right testis into scrotum during fetal development. In two third of cases, indirect hernias

are unilateral and in one third of cases they are bilateral. Direct inguinal hernias are bilateral in half of the cases.

In our series, 53.75% (43) cases were on the right side, 36.25% (29) were on the left side and 10% (8) on both sides.

Table 5 : Duration of hernia

Among the cases studied, 36.25% (29) of the patients presented to our hospital within 6 months, 25% (20) by 1 to 12 months, 27.5% (22) by 5 years, 6.25% (5) by 10 years and 5% (4) took more than 10 years.

Probability of complications due to hernia increases as the duration of symptoms increases.

Intra-operative complications :

Among 80 cases studied none had bladder or bowel or vas deferens injury

Table 6: Early Complications :

Among 40 patients who underwent mesh repair 5 (12.5%) developed severe pain, 2 (5%) developed urinary retention of which both passed urine with conservative treatment.

3 cases (7.5%) developed infection and were treated with antibiotics according pus culture and sensitivity. 3 (7.5%) developed seroma and it resolved after aspiration. None developed ischemic orchitis / secondary hydrocele / haematoma / osteitis pubis.

Among the other 40 patients who underwent tissue repair 20 developed severe pain (50%) 6 developed urinary retention (15%) of whom 3 required catheterisation and 5 passed urine with conservative measures.

4 cases developed infection (10%) which were treated with drainage of pus and antibiotics according to pus culture and sensitivity. 1 patient (2.5%) developed seroma which subsided with aspiration. 3 patients developed osteitis pubis (7.5%). None developed ischemic orchitis/secondary hydrocele/haematoma in tissue repair.

Table 7. Late complications

80 cases studied, were followed at 3 months, 6 months and at 1 year among which 88.75% (71) cases were followed in the outpatient department, to look for chronic pain and recurrences and the remaining cases did not turn up for the followup.

Among 40 cases who underwent mesh repair 2 (5%) developed chronic groin pain, which settled with analgesics and one (2.5%) developed recurrence whereas among 40 cases who underwent tissue repair 5 developed chronic groin pain (12.5%) and 3 (7.5%) developed recurrence after 6 months of surgery who had infection in the early post-operative period. Mesh infection and rejection occurred in one among 40 cases who underwent mesh repair.

Table 8 : Comparison of complications by chi-square test

On comparing the complications in both the techniques by chi-square test, the value was significant (0.008) which shows the complications in tissue repair is significantly more than mesh repair.

SUMMARY

Inguinal hernia is one of the most common surgical problems. Here complications of mesh repair is compared with that of tissue repair done for inguinal hernias at GRH, Madurai.

All age groups are affected with inguinal hernia of whom more than 45% were over 31 years.

Inguinal hernia is common in males and only one female patient was encountered in our study out of eighty patients.

Indirect hernias (13.75%) are more common than direct hernias (22.5%) and some of them are pantaloon hernias (3.75%).

53.75% of inguinal hernias were on right side and 36.5% on the left side and 10% were on both sides.

In our study, 36.25% of patients reported within 6 months after noticing an inguinal swelling whereas 27.5% took 1 to 5 years, 25% took 6-12 months, and 5% took more than 10 years.

Routine investigations were done and physician opinion for fitness for surgery and informed consent for surgery were taken for all patients.

40 patients underwent hernioplasty by Lictenstein's technique and 3 among 40 with bilateral hernia under went stoppa's repair and 40 patient underwent tissue repair by modified Bassini's technique.

In patients who underwent mesh repair post operative pain was present in 12.5%, urinary retention occurred in 5% which settled with conservative management and catheterisation.

7.5% of patients had wound infection which settled with drainage of pus and antibiotic treatment.

7.5% of patients developed seroma which settled with aspiration.

None had ischemic orchitis or secondary hydrocele or haematoma or osteitis pubis.

5% of patients developed chronic groin pain and 2.5% developed recurrence.

Among patients who underwent tissue repair 50% developed post operative pain, 15% developed urinary retention, which settled with catheterisation and conservative management.

10% of patients had wound infection which settled with drainage of pus antibiotics

2.5% of patients developed seroma which settled with aspiration.

7.5% of patients developed osteitis pubis. None developed ischemic orchitis or secondary hydrocele or haematoma in tissue repair.

12.5% of patients developed chronic groin pain which settled with analgesic. 7.5% of patients developed recurrence of inguinal hernia.

By comparing the complications in both the techniques by chi-square test, the value was significant (0.008) which shows the complications in tissue repair is comparatively more than mesh repair in our study.

CONCLUSION

In our study of comparison of complications in mesh Vs non-mesh repair of inguinal hernias, at Government Rajaji Hospital, Madurai, Post-operative complications like chromic groin pain, osteitis pubis and recurrence are less with mesh repair when compared to tissue repair. This comparatively lesser post–operative complications particularly recurrence, in mesh repair shown that it is a safe and better technique for inguinal hernia repairs.

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PROFORMA

Serial No :

Name :

Age/Sex :

Occupation :

Address :

IP No:

Date of Admission :

Date of Surgery :

Date of Discharge

Diagnosis

Nature of Surgery :

Intra operative complications

Injury to Vas deferens :

Injury to other viscera :

Post operative complications

a) Early

Pain :

Urinary retention :

Wound infection :

Haematoma – wound:

Scrotal :

Seroma :

Osteitis pubis :

Ischemic orchitis

Post – hernia repair hydrocele :

b) Late:

Chronic groin pain :

Recurrence :

Mesh infection or rejection :

Master Chart

S.No.	Name	Age	Sex	IP No.	Diagnosis	Procedure
1	Manoj	15	M	471617	Rt.indirect inguinal hernia	Rt.herniorraphy
2	Paulsamy	55	M	465724	Bl.direct inguinal hernia	Bl.hernioplasty
3	Chinnavellai	47	M	476238	Rt. direct inguinal hernia	Rt. hernioplasty
4	Abdul Kadhar	18	M	486240	Rt.indirect inguinal hernia	Rt.herniorraphy
5	Duraipandi	48	M	478768	Rt. direct inguinal hernia	Rt.hernioplasty
6	Ramachandran	64	M	478875	Bl.indirect inguinal hernia	Bl.hernioplasty
7	Velu	70	M	480173	Rt.indirect inguinal hernia	Rt.hernioplasty
8	Mohan	49	M	487544	Lt.direct inguinal hernia	Lt.hernioplasty
9	Ekambaram	55	M	488944	Rt.direct inguinal hernia	Rt.hernioplasty
10	Raju	70	M	487586	Lt.direct inguinal hernia	Lt.hernioplasty
11	Karthikeyan	30	M	492590	Rt.indirect	Rt.herniorraphy

					inguinal hernia	
12	Balasubramani	52	M	493849	Rt.indirect inguinal hernia	Rt.herniorraphy
13	Velayutham	68	M	492441	Rt.direct inguinal hernia	Rt.hernioplasty
14	Periyasamy	24	M	16124	Bl.indirect inguinal hernia	Bl.herniorraphy
15	Maruthamuthu	32	M	91708	Lt.indirect inguinal hernia	Lt.herniorraphy
16	Nagaraj	35	M	12336	Rt.indirect inguinal hernia	Rt.herniorraphy
17	Ponnusamy	27	M	14256	Lt.direct inguinal hernia	Lt.herniorraphy
18	Rajkumar	22	M	16001	Rt.indirect inguinal hernia	Rt.herniorraphy
19	Anifa	50	M	11454	Lt.direct inguinal hernia	Lt.hernioplasty
20	Thangavel	47	M	39790	Rt.direct inguinal hernia	Rt.hernioplasty
21	Jeyapandi	20	M	560444	Lt.indirect inguinal hernia	Lt.herniorraphy
22	Mohammed	28	M	59234	Lt.direct inguinal hernia	Lt.herniorraphy

23	Siva	38	M	448468	Rt.indirect inguinal hernia	Lt.hernioplasty
24	Pandian	37	M	80063	Lt.indirect inguinal hernia	Lt.herniorraphy
25	Ashokan	40	M	86637	Rt.indirect inguinal hernia	Rt.hernioplasty
26	Pandivel	45	M	80071	Rt.indirect inguinal hernia	Rt.hernioplasty
27	Suresh	23	M	80114	Lt.indirect inguinal hernia	Lt.herniorraphy
28	Pandi	45	M	85257	Bl.direct inguinal hernia	B1.hernioplasty
29	Renganayaki	25	F	90245	Lt.indirect inguinal hernia	Lt.herniorraphy
30	Natarajan	23	M	96225	Lt.indirect inguinal hernia	Rt.herniorraphy
31	Shahul Hameed	24	M	20841	Rt.indirect inguinal hernia	Rt.herniorraphy
32	Kuppapitchai	65	M	100860	Rt.indirect inguinal hernia	Rt.herniorraphy
33	Mahalingam	26	M	26570	Lt.indirect inguinal hernia	Lt.herniorraphy
34	Pandi	38	M	30591	Lt.indirect	Lt.hernioplasty

					inguinal hernia	
35	Abdulla	45	M	37395	Rt.direct inguinal hernia	Rt.hernioplasty
36	Chelladurai	54	M	35467	Rt.indirect inguinal hernia	Rt.hernioplasty
37	Ramar	70	M	38254	Rt.direct inguinal hernia	Rt.hernioplasty
39	Palanikumar	15	M	35974	Lt.indirect inguinal hernia	Lt.herniorraphy
40	Vazhavanthan	57	M	46320	Rt.direct inguinal hernia	Rt.hernioplasty
41	Vairavan	35	M	49217	Rt.indirect inguinal hernia	Rt.hernioplasty
42	Srinivasan	20	M	50728	Bl. Indirect inguinal hernia	Bl.herniorraphy
43	Ganesan	25	M	55512	Rt.direct inguinal hernia	Rt.hernioplasty
44	Muthalif	55	M	45137	Lt.indirect inguinal hernia	Lt.hernioplasty
45	Murugan	30	M	64641	Bl.indirect inguinal hernia	Bl.hernioplasty
46	Natarajan	56	M	62761	Rt.direct inguinal hernia	Rt.hernioplasty

47	Pandiselvam	16	M	55410	Rt.indirect inguinal hernia	Rt.herniorraphy
48	Balasubramanian	43	M	68344	Rt.direct inguinal hernia	Rt.hernioplasty
49	Arputharaj	40	M	68438	Rt.indirect inguinal hernia	Rt.herniorraphy
50	Balsamy	16	M	71126	Bl.indirect inguinal hernia	Bl.herniorraphy
51	Velsamy	18	M	75763	Rt.indirect inguinal hernia	Rt.herniorraphy
52	Subramanian	25	M	75736	Rt.indirect inguinal hernia	Rt.herniorraphy
53	Pandiselvan	36	M	75730	Rt.indirect inguinal hernia	Rt.herniorraphy
54	Alagu	35	M	75736	Lt.indirect inguinal hernia	Lt.herniorraphy
55	Raja	20	M	66598	Rt.indirect inguinal hernia	Rt.herniorraphy
56	Kaja Mydheen	50	M	62777	Rt.indirect inguinal hernia	Rt.hernioplasty
57	Arivazhagan	16	M	54983	Rt.indirect inguinal hernia	Rt.herniorraphy
58	Piran Sahib	57	M	64549	Lt.indirect	Lt.hernioplasty

					inguinal hernia	
59	Kathiresan	20	M	59102	Lt.indirect inguinal hernia	Lt.herniorraphy
60	Paneer Selvam	18	M	57289	Rt.indirect inguinal hernia	Rt.herniorraphy
61	Sarathkumar	18	M	64790	Lt.indirect inguinal hernia	Lt.herniorraphy
62	Pandi	37	M	61377	Rt.indirect inguinal hernia	Rt.herniorraphy
63	Nambirajan	25	M	63711	Lt.indirect inguinal hernia	Lt.herniorraphy
64	Dhanabalan	40	M	57878	Rt.Pantaloon inguinal hernia	Rt.hernioplasty
65	Balakrishnan	16	M	69613	Lt.indirect inguinal hernia	Lt.herniorraphy
66	Williams	30	M	68379	Lt.indirect inguinal hernia	Lt.herniorraphy
67	Nagaraj	20	M	57914	Rt.indirect inguinal hernia	Rt.herniorraphy
68	Muthiah	42	M	60013	Lt.Pantalon inguinal hernia	Lt.hernioplasty
69	Mariyapan	35	M	65459	Rt.indirect inguinal hernia	Rt.herniorraphy

70	Nirojan	19	M	52236	Lt.indirect inguinal hernia	Lt.herniorraphy
71	Chittaranjan	25	M	52521	Lt.indirect inguinal hernia	Lt.herniorraphy
72	Velmurugan	38	M	65589	Lt.indirect inguinal hernia	Lt.hernioplasty
73	Muralimuthu	19	M	50047	Rt.indirect inguinal hernia	Rt.herniorraphy
74	Das	38	M	52119	Rt.indirect inguinal hernia	Rt.herniorraphy
75	Surankattan	53	M	52825	Lt.pantaloon inguinal hernia	Lt.hernioplasty
76	Muthu	20	M	54023	Rt.indirect lnguinal hernia	Rt.herniorraphy
77	Saravanan	15	M	56213	Rt.indirect inguinal hernia	Rt.herniorraphy
78	Gurunathan	40	M	76421	BL.indirect inguinal hernia	BL.hernioplasty
79	Valavanthan	55	M	46370	Rt.indirect inguinal hernia	Rt.hernioplasty
80	Sundaram	40	M	57217	Rt.indirect inguinal hernia	Rt.hernioplasty